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glass with increasing B_2O_3 content. It was likely that this connectivity was due to the formation of P-O-B links at 890 cm^{-1}, which replaced the vibration mode P-O-P. The increasing of B_2O_3 content and decreasing the P_2O_5 content causes the boron coordination changes from trigonal to tetrahedral and the basic units change from BO_3 to BO_4. Overall, the high frequency bands corresponding to stretching vibration become broader, less distinct and overlap each other with an increasing B_2O_3 content and decreasing P_2O_5 content.
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Luminescence Studies on Lithium-Strontium Borophosphate Glasses Doped with Cr, Ni and Zn Ions

Authors: Poh Sum Wong, Wan Ming Hua, Rosli Hussin, Zuhairi Ibrahim

Abstract: Luminescence material is a solid which converts certain types of energy into electromagnetic radiation over and above thermal radiation. Due to the limited studies on luminescence properties of the transition metal ion doped glass, this present study aiming to understand further the effect of doping different transition metal ions to the luminescence properties. This paper report on the luminescence properties of $20Li_2O$-$20SrO$-$30B_2O_3$-$30P_2O_5$ glasses doped from the photoluminescence spectroscopy. The luminescence spectra of $20Li_2O$-$20SrO$-$30B_2O_3$-$30P_2O_5$-x with x = 1 mol % of different transition metal ions (Cr, Ni, and Zn) which had been prepared by melt quenching technique. The luminescence properties were analyzed using photoluminescence spectroscopy. Based on the emission spectra obtained from $20Li_2O$-$20SrO$-$30B_2O_3$-$30P_2O_5$-Cr, it consists of two emission bands at around 348 nm and 369 nm. While for the luminescence spectra of $20Li_2O$-$20SrO$-$30B_2O_3$-$30P_2O_5$-Ni, it exhibits only one emission band which is at around 363 nm. Lastly, for the luminescence spectra of $20Li_2O$-$20SrO$-$30B_2O_3$-$30P_2O_5$-Zn, it exhibits two emission bands at around 379 nm and 434 nm.
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Application of Biological-Based Antifungal Agent for Controlling the Growth of Wood Decaying Fungi of Rubberwood

Authors: Teoh Yi Peng, Mashitah Mat Don

Abstract: Rubberwood played a crucial role in industries development in Malaysia, particularly in furniture sector. Preservative of rubberwood becomes important tool in order to obtain an environmental friendly antifungal agent. Thus, biological-based control agent was an alternative way to solve this issue. This study was conducted on the bio-production of antifungal agent towards the growth of wood decaying fungi of rubberwood. *Schizohpyllum commune* had reported to product schizophyllan during secondary metabolites, in which could possed antimicrobial activity. Batch solvent extraction using three solvent systems was carried out. After hydrodistillation process for 48 h, the results showed that 70% (v/v) methanol-water system provided the maximal extraction yield (41.47 %) for *S. commune* mycelia. The extracted antifungal agent had applied on the rubberwood block to investigate its effectiveness. The result

found that the concentration at 5 µg/µl could inhibit the growth of white-rot fungi, in which was similar to that observed using minimum inhibitory concentration (MIC) assay previously.
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The Effect of Substrate Temperatures on the Structural and Optical Properties of Cosputtered ZnO and AlN Thin Films

Authors: A. Ismail, Mat Johar Abdullah

Abstract: AlN doped ZnO thin films were prepared on glass and Si (100) substrates by RF sputtering. For AlN doped ZnO at RF powers of 200 W (ZnO target) and 200W (AlN target), the ZnO (002) peak showed the highest intensity at the substrate temperature of 400˚ C. The prepared films showed good transmission of above 72 % in the visible range. The calculated values of energy band gaps were in the range (3.42 eV - 3.54 eV) for the films prepared at different substrate temperatures.
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The Effect of Ultrasonic Treatment and Gamma Radiation on the Thermal Conductivity of TPNR Hybrid Nanocomposites

Authors: Mou'ad A. Tarawneh, Sahrim Haji Ahmad

Abstract: This paper discusses the effect of Gamma radiation and ultrasonic treatment time on hybrid nanofillers nanoclay and multi-walled carbon nanotubes (MWCNTs) as reinforcing agents to improve the thermal conductivity of TPNR. The laser flash technique was also employed to determine the thermal conductivity of the hybrid nanocomposite. The thermal conductivity of hybrid nanocomposites that were sintered at 30 to 150 °C did not show a monotonous change with MWCNTs as the filler has a high thermal conductivity compared to nanoclay by using different dose of gamma radiation or with different time of ultrasonic treatment. TEM results showed a combination of intercalated-exfoliated structure of OMMT and the dispersion of MWCNTs in the TPNR composite. The probability that hybrid nanoparticles form a network depends on the interaction between the particles, on their shape (aspect ration), preparation conditions and on their inter-particle distance will control the thermal conductivity of the hybrid nanocomposite.
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Unconfined Compressive Strength and Drying Shrinkage of Cement Treated Recycling Base at Boyolali-Kartosuro Road Rehabilitation

Authors: Ary Setyawan, Anastasia Muda, Sholihin As'ad

Abstract: Road rehabilitation and reconstruction generate large supplies of reclaimed asphalt pavement (RAP). One of the efforts to reuse the RAP is by insitu process and utilize it as road base materials. To get satisfying result from the RAP, it is necessary to add a certain amount of Ordinary Portland Cement (OPC) as stabilizer. This study investigate the potential use of OPC-stabilized RAP in road bases. Laboratory experimental method was applied by using material collected from road located at

Boyolali-Kartasura as the object of the study with the cement content variations of 4%, 5% and 6% for unconfined compressive strength test (UCS) and the cement contents variation of 5% and 6% for drying shrinkage test. The range of cement contents required for unconfined compressive strength of cement treated recycling base (CTRB) are 5% to 6%. The cement content used at Boyolali - Kartosuro road rehabilitation was 5.5%. Drying shrinkage during 28 days is 805.3 micro strain for the cement content of 5% and 826.3 micro strain for the cement content of 6%. The drying shrinkage of the materials was quite high for CTRB, so that carefully design and attention need to take into account to avoid the cracks at the road base and the prospective of reflective cracking at the surface course of the road.
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Mixed Photocatalyst for Sustainable Concrete Construction

Authors: Ranjit K. Nath, M.F.M. Zain, Abdul Amir Hassan Kadhum, Rabiul Alam

Abstract: An innovative approach to the material science has demonstrated that photocatalytic activity may be conferred to cement-based construction materials, such as concrete, mortars, paints, etc. Photocatalyst is needed for a cleaner environment and a better quality of life that leads to thoughts of a more eco-compatable use of light. Addition of photocatalytic materials to the RC structure during its construction phase could reduce the corrosion problem of RC materials. This material hinders calcium oxide to form acidic compound. In this study, cement-based mixed photocatalytic material has been presented, which would adjustable with RC material for enhancing oxidization process and reducing corrosion problem.
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Utilization of Raw Gypsum as Hydrated Filler in Bagasse Particleboard Bonded with a Formaldehyde-Free Epoxidized Natural Rubber Adhesive

Authors: Bencha Thongnuanchan, Somporn Suwanpetch, Charoen Nakason

Abstract: The present study described the feasibility of using raw gypsum as filler to improve the flame retardant and mechanical properties of particleboard (PB) prepared from bagasse. The PB was made with a formaldehyde-free adhesive based on epoxidized natural rubber (ENR) latex via a hot pressing process. The effect of gypsum loading on the mechanical properties of the PB was initially investigated. Both the tensile strength and modulus of rupture (MOR) of the PB tended to increase with increasing gypsum loading and reached the maximum values at 150 phr. The incorporation of gypsum into the PB beyond this loading level brought about a decrease in the corresponding properties. A horizontal burning test was conducted to determine the flame retardant properties of the PB (i.e., elapsed time and burning rate). The PB containing 150 phr of gypsum (PB-150G) was found to have a much shorter elapsed time and a lower burning rate than the PB with no gypsum added. The lower values of the corresponding properties indicated the better flame retardancy of PB. It was also found that the PB-150G exhibited a comparable level of flame retardancy to the PB containing 8 wt% of total flame retardants (i.e., 5 wt% magnesium chloride in combination with 3 wt% antimony trioxide) based on the combined weight of bagasse

and ENR contained in the PB. These results revealed that the use of an appropriate amount of gypsum as filler could significantly enhance the flame retardancy with considerable improvement in the mechanical properties of BP.
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Thermoplastic Natural Rubber Based on Blending of Co-Polyester: Effect of Amount of Epoxide Groups in Epoxidized Natural Rubber on Preperties

Authors: Krisna Sasdipan, Azizon Kaesaman, Charoen Nakason

Abstract: TPNRs based on blending of co-polyester (i.e., PBT/PC) and epoxidized natural rubber (ENR) with various epoxide content (i.e., 10, 20, 30, 40 and 50 mol% epoxide) were prepared by dynamic vulcanization. It was found that the co-polyester/ENR blends gave better properties (i.e., mechanical, dynamic mechanical, morphological and oil resistant properties) than that of co-polyester/unmodified NR blend. It was also found that co-polyester/ENR with 50 mol% epoxide exhibited the highest tensile strength, elongation at break, modulus at 100% elongation, hardness, storage modulus, complex viscosity and oil resistant properties but showed the lowest tension set value. This indicates the highest elasticity. Moreover, it was found that size of vulcanized rubber domains dispersed in thermoplastic matrix decreased with increasing the epoxide content in ENR molecules.
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Effect of Sulfur Donor on Properties of Thermoplastic Vulcanizates Based on NR/PP

Authors: Chanida Manleh, Charoen Nakason, Natinee Lopattananon, Azizon Kaesaman

Abstract: Thermoplastic vulcanizates based on natural rubber and polypropylene blend (NR/PP) was prepared *via* dynamic vulcanization by melt mixing process at 180°C and a rotor speed of 60 rpm. Three types of vulcanizing agent (i.e., Tetramethyl thiuram disulfide (TMTD), 4,4 Dithiodimorpholine (DTDM) and Dipentamethylene thiuram tetrasulfide (Tetrone A)) were used to cure the rubber phase of NR/PP blends. Influence loading levels of sulfur donor at 1, 2 and 3 phr on dynamic properties and crosslink density were studied. The result showed that the dynamically cured NR/PP blends with Tetrone A gave higher mechanical properties, storage modulus, complex viscosity, and crosslink density with the lower value of tanδ than those of the blends with TMTD and DTDM. Furthermore, the storage modulus, complex viscosity and crosslink density of TPVs increased with increasing loading levels for all types of sulfur donor. It was also found that thermal stability of dynamically cured NR/PP blends is higher than that of the pure NR.
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Thermoplastic Elastomer Based on Epoxidized Natural Rubber/Polyamide-12 and Co-Polyamide-12 Blends

Authors: Rawviyanee Romin, Charoen Nakason, Anoma Thitithammawong

Abstract: Thermoplastic elastomers based on blending of epoxidized natural rubber with 30 mol% epoxide (ENR-30) with polyamide-12 (PA-12) (i.e., ENR-30/PA-12) and blending of ENR-30 with co-polyamide-12 (ENR-30/CO-PA-12) were prepared by dynamic vulcanization technique. It was found that the dynamically cured ENR-30/PA-12 blends exhibited higher tensile strength, Youngs modulus and hardness than those of the ENR-30/CO-PA-12 blends. However, the elongation at break of the ENR-30/PA-12 blend was very poor and hence the tension set could not be determined. On the other hand, the ENR-30 contents in the dynamically cured ENR-30/CO-PA-12 influence on various properties. These include lowering of stiffness and tensile properties together with enhancing elastic properties (i.e. lower tension set and tan) of the blends.
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Preparation of Natural Rubber/Sodium Montmorillonite Nanocomposites by Latex Mixing Method with Drying Process

Authors: U. Sookyung, Charoen Nakason, W. Thaijaroen

Abstract: Natural rubber/sodium montmorillonite nanocomposites were prepared by using natural rubber latex without using acid coagulation. Cure characterization indicated that Na-MMT retarded the vulcanization reaction of NR. The mechanical properties of the NR/Na-MMT nanocomposites were improved with addition of Na-MMT which is attributed to the reinforcing effect of Na-MMT with rubber. Furthermore, the storage modulus (E) of the nanocomposites was higher than that of the pure NR vulcanizate. Furthermore, glass transition temperature (T_g) was shifted to higher temperature and lower Tan δ value was observed upon increasing loading levels of Na-MMT. Moreover, the nanocomposite showed higher thermal stability than that of the pure NR vulcanizate.
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Thermoplastic Natural Rubber Based on Blending of Maleated Natural Rubber and Copolyester: Effect of Blend Ratios on Mechanical, Thermal, Dynamic and Morphological Properties

Authors: Suwaiyah Lamlaeh, Azizon Kaesaman, Charoen Nakason

Abstract: Maleated natural rubber (MNR) was synthesized and formulated to prepare thermoplastic natural rubber (TPNRs) by blending with copolyester (COPE). It was found that tensile strength and hardness of the TPNRs increased with increasing proportions of COPE, while the elongation at break decreased. Furthermore, tension set decreased with increasing proportions of MNR in the blends which reflects enhancing of rubber elasticity. Themogravimetry analysis (TGA) was used to characterize the TPNRs. It was found that the decomposition temperature (T_d) of the blend increased with increasing proportions of COPE. Morphological properties were also determined by SEM technique. It was found that the MNR/COPA simple blends with the proportion of rubber 40, 50 and 60 wt % exhibited the co-continuous phase structures.
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Co-Continuous Phase Structure and Properties of Poly(vinylidene Fluoride)/Epoxidized Natural Rubber Blends

Authors: Subhan Salaeh, Charoen Nakason, Gisèle Boiteux, Philippe Cassagnau

Abstract: Thermoplastic elastomer based on poly (vinylidene fluoride) (PVDF) and epoxidized natural rubber (ENR) blends at 50/50 by weight with different type of ENR (i.e., ENR with 25 and 50 mol% epoxide which are called as ENR-25 and ENR-50, respectively) has been prepared by melt blending method. Difference content of epoxide groups in ENR molecules on dynamic mechanical properties, dielectric properties and morphological properties of blends were investigated. The morphology reveals the co-continuous phase structure of PVDF and ENR phases. Furthermore, ENR-50/PVDF blend showed finer grain morphology and the glass transition (T_g) of the rubber phase was shifted to lower temperature. The structure of the blends correlated well with permittivity (ε) in dielectric properties with the permittivity of PVDF/ENR-50 higher than that of PVDF/ENR-25.

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Influence of Zinc Oxide Contents on Mechanical, Rheological and Thermal Properties of Thermoplastic Natural Rubber

Authors: Anoma Thitithammawong, Nattapon Uthaipan, Adisai Rungvichaniwat

Abstract: The influence of ZnO contents on properties of the natural rubber/polypropylene thermoplastic vulcanizates (NR/PP TPVs) is investigated. The NR/PP TPVs with ZnO obviously show improvement of mechanical, rheological and thermal properties comparing to the TPV without ZnO addition. The ZnO content does not much affect on mechanical and rheological properties of the TPVs. However, it strongly influences on thermal property especially decomposition temperatures at 5 and 50 %wt loss of polymer (T_{d5} and T_{d50}) and onset decomposition temperature of rubber phase (Tr_{onset}).

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Fundamental Studies on Cure Characteristics and Mechanical Properties of Nanocomposites Based on Epoxidized Natural Rubber (ENR-30) and Montmorillonite Clay

Authors: Piriyapol Yokkhun, Bencha Thongnuanchan, Charoen Nakason

Abstract: The present study focused on investigating the cure characteristics and mechanical properties of nanocomposites based on epoxidized natural rubber with 30 mol% epoxide (ENR-30)/nanoclay. ENR-30 based nanocomposites were prepared by melt compounding in an internal mixer and cured using a conventional sulphuric system. Two types of nanoclays were used in this study, sodium montmorillonite (Na-MMT) clay and Na-MMT that had been modified with octadecylamine, also referred to as OC-MMT. Overall results show that OC-MMT was more efficient in enhancing the mechanical properties of the ENR-30 nanocomposite than Na-MMT. This was probably attributed to the higher interlayer distance of OC-MMT, which was confirmed by X-ray

diffraction results. The incorporation of OC-MMT into ENR-30 led to an increase in both the maximum torque (M_H) and torque difference (M_H-M_L), which suggested an increase in the stiffness and crosslink density of the nanocomposite, respectively. A pronounced improvement in the tensile strength of the ENR-30/OC-MMT nanocomposite as compared to the unfilled ENR-30 was observed at 5 phr of OC-MMT, which appeared to be an optimum loading level. However, a gradual reduction in the elongation at break was observed with increasing OC-MMT loading.
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Comparing the Seismic Performance of Beam-Column Joints with and without SFRC when Subjected to Cyclic Loading

Authors: Kay Dora Abdul Ghani, Nor Hayati Hamid

Abstract: The experimental work on two full-scale precast concrete beam-column corner joints with corbels was carried out and their seismic performance was examined. The first specimen was constructed without steel fiber, while second specimen was constructed by mixed up steel fiber with concrete and placed it at the corbels area. The specimen were tested under reversible lateral cyclic loading up to ±1.5% drift. The experimental results showed that for the first specimen, the cracks start to occur at +0.5% drifts with spalling of concrete and major cracks were observed at corbel while for the second specimen, the initial cracks were observed at +0.75% with no damage at corbel. In this study, it can be concluded that precast beam-column joint without steel fiber has better ductility and stiffness than precast beam-column joint with steel fiber. However, precast beam-column joint with steel fiber has better energy dissipation and fewer cracks at corbel as compared to precast beam-column joint without steel fiber.
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The Impact of Mechanical Vibration on the Hardening of Metallic Surface

Authors: Mohamed Amine Djema, Khaled Hamouda, Anatoly P. Babichev, Djamel Saidi, D. Halimi

Abstract: One of functional parameters which have a big influence on the reliability of machine is the surface quality of mobile and immobile parts. The quality working ability of the surface in contact is depending of their surfaces strength. In this regard, we used vibro-mechanical treatment to increase the hardness of the contact surfaces which is considered as formed surface of plastic deformation. The formed plastic deformation surface is also a kind of micro relief surface, characterized by multitude closed and superimposed on each other traces of contact with the particles working environment cultivated surface. The quality of the surface resulting from the vibro-impact treatment, provide a sufficiently high wear parts. This paper presents experimental results of using the vibro-impact treatment on surface fatigue strength using samples of steels, aluminums and titans alloys. The objective of this study is to improve performance functional surfaces in contact by choosing optimal hardening parameters.
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Optimization of Process Parameters in Bioreduction of Silver Nanoparticles by *Pycnoporus sanguineus*

Authors: Yen San Chan, Mashitah Mat Don

Abstract: Controlling the size of nanomaterials are attracting great interest in the research on scientific and technological applications because of their unit properties for achieving specific processes especially in biological and medical applications. Microbial assisted biosynthesis of nanoparticles is of growing potential in the area of bionanotechnology compared to chemical synthesis when dealing with medical and pharmaceutical applications. A simple and effective approach for AgNPs synthesis by *Pycnoporus sanguineus* was demonstrated and the effect of production mode on controlling size of AgNPs produced was studied. Culture supernatant of *Pycnoporus sanguineus* was used to synthesis AgNPs of nanosize. One factor at a time (OFAT) method was employed to perform optimization on process parameter such as inoculum size and $AgNO_3$ concentration. The morphology, uniformity and concentration of AgNPs were investigated using dynamic light scattering (DLS) zetasizer and atomic absorption spectroscopy. It was observed that increase in inoculum size leads to decrease in size of AgNPs and increase of AgNPs concentration. Hence, it can be deduced that optimizing the bioprocess parameters led to superior control of AgNPs size.
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Generic Framework for Conceptual Design Using Concurrent Engineering Strategy. A Case Study: Advanced Material Application Product Development of Metal Matrix Composite Component

Authors: Nanang Fatchurrohman, Shamsuddin Sulaiman, S.M. Sapuan, Mohd Khairol Anuar Ariffin, B.T.H.T. Baharuddin

Abstract: One of the keys to success for product competition in the market depends on the effectiveness of its product development. This article presents a generic framework of product development which focuses on the conceptual design. The framework is developed with concurrent engineering strategy where it takes into account the product life cycle considerations within the early phases of the conceptual design. The proposed framework starts from product investigation, product specification and conceptual design. Implementation of the framework is illustrated on a case study of metal matrix composite brake disc rotor design, where there is an avenue for conceptual research since the progress of metal matrix composite utilisation in the automotive industry is limited due to their high cost in comparison with conventional alloy. The possible outcome for product investigation, product specification and conceptual design of metal matrix composite brake disc rotor are presented as part of the selection of best conceptual design. Moreover, the proposed framework is an aid to help engineers and designers to make an effective and systematic product development through a sound conceptual design decision from possible product concept alternatives.
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An Experimental Study on the Die Roll Height According to the V-Ring Distance of the Fine Blanking Tool for the Seat Recliner Holder with Various Corner Shapes

Authors: Jong Deok Kim, Young Moo Heo, Heung Kyu Kim

Abstract: In this paper, the relation between die roll height and V-ring distance of a fine blanking tool was studied by experimenting on a special designed seat recliner holder with various corner shapes. Three guide plate inserts with different V-ring distances and a die insert with constant die chamfer were machined, and a fine blanking tool was manufactured for the experiments. Three experiments were conducted on a 650-ton fine blanking press. Each die roll height on the sample from the experiments was measured and analyzed. It should be noticed that the die roll heights on the corner shapes of fine blanked parts increase with increasing the distance between the V-ring distance, and decrease with increasing corner radius and angle. These results can be used to minimize the die roll height of fine blanking parts with corner shapes when designing the V-ring of a fine blanking tool.

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The Carbon Black Sonofication Effects on Vulcanisate Properties of Natural Rubber

Authors: Mahendra Anggaravidya, Sudirman Sudirman, Bambang Soegijono, Emil Budianto, Martin Djamin

Abstract: The mechanical properties of natural rubber can be enhanced by the addition of carbon black. The mechanical properties change is highly affected by particle size and carbon black structure used. A modification of N660 carbon black was conducted in the research by sonoficating the carbon black for 3 and 5 hours (N600-M3; M5). The results of adding modified carbon black were characterised by Particle Size Analysis (PSA), Scanning Electron Microscopes - Energy Dispersive Spectrometry (SEM-EDS) and Thermogravimetric Analysis (TGA). The addition of modified carbon black shows bound rubber, thermal properties, and mechanical properties such as tensile strength, elongation at break and modulus 300% on the vulcanisate produced were increased from the vulcanisate that had been filled with N660 natural (N660-N). Keywords: natural rubber, carbon black, particle size, sonofication, characterisation

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Mechanical Properties of Engineered Cementitious Composite with Palm Oil Fuel Ash as a Supplementary Binder

Authors: Nurdeen M. Altwair, M.A. Megat Johari, Syed Fuad Saiyid Hashim, A.M. Zeyad

Abstract: Palm oil fuel ash (POFA) was used to produce engineered cementitious composite (ECC) in this research where ECC mixtures containing different volume of POFA (up to 55% by weight) of cement, were prepared. Mechanical properties of the resulting ECC mixtures were assessed using the compression, flexural and uniaxial tensile tests. The findings of the study show that the use of POFA improves the

mechanical properties of the ECCs. The ECC mix with 1.2 POFA/cement ratio achieved a compressive strength of 30 MPa at 28 days, which is within the normal range of concrete strength for many applications. Moreover, the results portray that the use of POFA should be helpful for achieving strain-hardening behaviour. The increase in the POFA content concomitantly increased the flexural deflection and tensile strain capacities of the POFA-ECC. Furthermore, crack width of the ECC was significantly decreased with an increase of POFA content. In addition, the resulting POFA-ECC is expected to enhance the material greenness and durability.
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Effect of Different Olive Stone Particle Size on the Yield and Surface Area of Activated Carbon Production

Authors: Tamer M. Alslaibi, Ismail Abustan, Mohd Azmier Ahmad, Ahmad Abu Foul

Abstract: Usually, a few preliminary stages have been done for raw materials before the actual production of activated carbon such as materials crushing, milling and sieving to an appropriate particle size. Particle size is important for the subsequent handling of the raw material, such as mixing with a catalyst or impregnation, but it can also affect the properties of the subsequent activated carbon. This research was assessed the effect of different olive stone particle size on activated carbon production by KOH using the yield and surface area response. Three particle size ranges were examined, namely 1-2mm, 2-4.75 and the raw material in its original form. The results demonstrated that the most suitable form was 2mm to 4.75mm which resulted in 38.67% of yield and 886.72 $m^2 g^{-1}$ of a surface area and it has more rigidity compared with finer particle size and has more surface area and yield compared with olive stone in its original form.
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Preparation and Characterization of Fe_3O_4/TiO_2 Composites by Heteroagglomeration

Authors: Adel Fisli, Rahmi Saridewi, Sari Hasnah Dewi, Jarnuzi Gunlazuardi

Abstract: Fe_3O_4/TiO_2 composites were prepared by heteroagglomeration. The composites of different Fe_3O_4 to TiO_2 weight ratio were prepared by mixing of prepared Fe_3O_4 with TiO_2 in aqueous slurry, under ultrasonic treatment. All prepared samples were characterized by XRD, VSM, SEM/EDS, raman spectroscopy and BET. The prepared composites contained TiO_2 (anatase and rutile) and Fe_3O_4 crystal phases. The magnetization hysteresis loop for Fe_3O_4/TiO_2 nanocomposites indicated that the hybrid catalyst showed superparamagnetic characteristics at room temperature. Photocatalytic performance of the prepared composites was examined by its ability to degrade methylene blue dye in aqueous solution. The photocatalytic activity of Fe_3O_4/TiO_2 composites was lower than that of pure TiO_2 sample because of the presence of non-active photocatalytic in composite (iron oxide). Under UV irradiation, the photocatalytic activity of Fe_3O_4/TiO_2 (1:1) composite was relatively similar to Fe_3O_4/TiO_2 (1:2), however, under sunlight irradiation, the photocatalytic activity of

Fe_3O_4/TiO_2 (1:2) composite was relatively increase. The Fe_3O_4/TiO_2 composite can be easily recovered from treated water in slurry-type reactor by the application of an external magnetic field.
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A Study of Fe-Based Composite Coating Fabricated by the Self-Propagating High Temperature Synthesis

Authors: Singsarothai Saowanee, Vishnu Rachpech, Niyomwas Sutham

Abstract: The steel substrate was coated by Fe-based composite using self-propagating high-temperature synthesis (SHS) reaction of reactant coating paste. The green paste was prepared by mixing precursor powders of Al, Fe_2O_3 and Al_2O_3. It was coated on the steel substrate before igniting by oxy-acetylene flame. The effect of coating paste thickness and the additives on the resulted Fe-based composite coating was studied. The composite coating was characterized by X-ray diffraction (XRD) and scanning electron microscope (SEM) couple with dispersive X-ray (EDS).
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Effect of Ar Gas Pressure on Phase Separation of Tungsten Silicides Intermetallic Compound *In Situ* Self-Propagating High Temperature Synthesis-Casting Process

Authors: Tawat Chanadee, Niyomwas Sutham, Jessada Wannasin

Abstract: Tungsten silicides intermetallic compound (WSi_2) was synthesized *in-situ* by self-propagating high temperature synthesis-casting of WO_3-Si-Al system in Ar gas environment. It is proposed that the extent of phase separation between oxide ceramic and intermetallic compound depends on the reaction temperature that made a lower viscosity and longer lifetime of the melted. The effects of inert gas pressure on densification of the intemetallic product were investigated.
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Applications of Acoustic Emission Technique Associated with the Fracture Process Zone in Concrete Beam – A Review

Authors: Siti Ramziah Basri, Norazura Muhamad Bunnori, Sakhiah Abdul Kudus, Shahidan Shahiron, Mohd Nazli Md. Jamil, Md Nor Noorsuhada

Abstract: This paper summarized the recent development within the application of acoustic emission technique in the formation of fracture process zone and the AE energy released during the fracture process in concrete beam specimens. AE technique is a non destructive technique which is a useful tool to study the energy released during the different failure mechanisms in different types of materials and fracture process is one of the failure mechanisms in concrete. Most of the researchers were applied three point bending test on plain concrete in order to determine the facture process zone of the concrete and some of them were used numerical modeling to verify their results. The results between AE data and experimental in different parameters such as specimens size and aggregate size are normally compared. As a conclusion, AE technique is a very useful tool to determine the fracture process zone in concrete.

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Characteristics of Treated Palm Oil Fuel Ash and its Effects on Properties of High Strength Concrete

Authors: A.M. Zeyad, M.A. Megat Johari, Norazura Muhamad Bunnori, K.S. Ariffin, Nurdeen M. Altwair

Abstract: Palm oil fuel ash obtained from palm oil mill was treated via screening, grinding and heating to improve its pozzolanic reactivity. The characteristics of the palm oil fuel ash before and after treatment were monitored to assess the changes in the properties of the palm oil fuel ash. The resulting ultrafine palm oil fuel ash was then utilized to produce high strength concrete by replacing the ordinary Portland cement at 0, 20, 40 and 60% on mass-for-mass basis. The results show that the treatment process undertaken reduces the particle size, diminishes the unburned carbon content, while at the same time increases the glassy phases. The utilization of the ultrafine palm oil fuel ash in high strength concrete was observed to improve workability especially at higher ultrafine palm oil fuel ash content. In addition, the long-term compressive strength of the high strength concrete was significantly increased with the ultrafine palm oil fuel ash inclusion. Further, the long-term rapid chloride permeability was significant reduced especially at higher ultrafine palm oil fuel ash content of 60%, which could be translated into superior durability performance.

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Morphological Structure of Pretreated Organo Layer Silicate Dispersion in Masterbatch Biodegradable Polymer Cassava Starch Clay Nanocomposite

Authors: Chandra Liza, Bambang Soegijono, Emil Budianto, Syah Johan Alinasiri, Jayatin Jayatin

Abstract: Biodegradable polymer using inexpensive renewable resources such as starch produced poor mechanical, barrier properties and transparency of product, these properties were the important parameter for packaging material. This research intended to study the effect of glycerol monostearate (GMS) treated organo layer silicate (OLS) in biodegradable polymer starch masterbatch to eliminate the inferior properties. Focus was in morphological structure of biodegradable polymer starch clay nanocomposite. Biodegradable polymer starch clay nanocomposite was prepared using Haake Rheomix Polydrive at a temperature of 100 °C for 5 minutes and screw speed 60 rpm and the product was used as masterbatch to get a better dispersion of OLS in the matrix. Masterbatch was formulated with the parameter of 35 %, 45 % and 50 % starch and 3.5 % of OLS. Morphological structure of biodegradable polymer starch clay nanocomposite was characterized using Scanning Electron Microscope (SEM), Atomic Force Microscope (AFM) and X-Ray Diffraction (XRD) to observe the dispersion and compatibility of the organo layer silicate in biodegradable nanocomposite matrix. XRD analysis provided the dispersion of organo layer silicate at 35% starch was better than 45% starch and 50% starch in materbatch. This was consistent with the SEM and AFM

result, masterbatch containing 50% starch had interfere the OLS dispersion and produced agglomeration of organo layer silicate. SEM images of masterbatch with 50 % loading level of starch shown structure that starch not completely thermoplasticized.
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Effect of RF Power on the Structural Properties of Magnetron Sputtered ZnO Thin Films Deposited at Room Temperature

Authors: Samsiah Ahmad, Nor Diyana Md Sin, M.N. Berhan, Mohamad Rusop

Abstract: Zinc oxide thin films were prepared at room temperature in pure argon ambient on glass substrates by RF magnetron sputtering. The effect of sputtering power (50~250 Watt) on the structural properties of the film were investigated. The thickness of ZnO thin films was measured using surface profiler (Dektak 150+). Atomic force microscopy machine (AFM-Park system XE-100) was used to characterize the morphology while the crystalinity have been characterized using XRD (Rigaku Ultima IV). It was found that the thickness, growth rate and RMS roughness increases with increasing RF power. All films exhibit the (002) plane which correspond to hexagonal wurtzite structure with the highest peak at 150 Watt.
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Sensitivity of ZnO Based NH_3 Sensor by RF Magnetron Sputtering

Authors: Samsiah Ahmad, Nor Diyana Md Sin, M.N. Berhan, Mohamad Rusop

Abstract: Zinc Oxide (ZnO) thin films were deposited onto SiO_2/Si substrates using radio frequency (RF) magnetron sputtering method as an Ammonia (NH_3) sensor. The dependence of RF power (50~300 Watt) on the structural properties and sensitivity of NH_3 sensor were investigated. XRD analysis shows that regardless of the RF power, all samples display the preferred orientation on the (002) plane. The results show that the ZnO deposited at 200 Watt display the highest sensitivity value which is 44%.
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Synthesis of Nano-Structured Ni-Co-Al Hydrotalcites and Derived Mixed Oxides

Authors: M. Abdus Salam, Ye Lwin, Suriati Sufian

Abstract: nanostructured hydrotalcite-like compounds that contain nickel, cobalt and aluminum have been synthesized by conventional coprecipitation method without using any surfactants or templating agents. The structure and morphology of the coprecipitated nanohydrotalcites and its derived mixed oxides were characterized by powder X-ray diffraction (XRD), Fourier-transformed Infrared (FTIR) spectroscopy, field-emission scanning electron microscopy (FESEM), high resolution transmission electron microscopy (HRTEM), and nitrogen adsorption-desorption techniques. The results show that the synthesized materials exhibited micro-meso-pore networks. The cobalt-rich calcined hydrotalcites are generally amorphous, having a coral-like morphology whereas nickel-rich hydrotalcites show hexagonal plate-like morphology. The presence of nickel in mixed oxides catalyzed the reduction of Co-Al-O spinels. The Fast Fourier

Transform (FFT) analysis of HRTEM revealed the inter planner distances of the crystal of hydrotalcite.
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Antibacterial Activity of Copper and CTAB Modified Clays against *Pseudomonas aeruginosa*

Authors: Nik Ahmad Nizam Nik Malek, Siti Amirah Ishak, Mohammed Rafiq Abdul Kadir

Abstract: Antibacterial activity of modified kaolinite and bentonite with antibacterial agents against *Pseudomonas aeruginosa* was studied. These clays have been modified with only cetyltrimethyl ammonium bromide (CTAB) and copper (Cu) and the combination of both. Characterization of the studied materials with X-Ray Diffraction (XRD), Fourier Transform-Infrared (FTIR) spectroscopy, Energy Dispersive X-ray (EDX) analyzer and Field Emission-Scanning Electron Microscopy (FESEM) revealed the successful preparation of CTAB-clays, Cu-clays and CTAB-Cu-clays without distorting the structure of these clays. From the antibacterial assay of the studied materials by Inhibition Growth Study and Minimum Inhibition Concentration (MIC) technique, CTAB-Cu-clays have been proven to have the highest antibacterial activity due to the synergistic effect of CTAB and Cu as antibacterial agents. It can be concluded that modification of clays with CTAB and Cu can become new alternative powerful antibacterial agent.
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The Influence of Deposition Temperature on the Morphology and Corrosion Resistance of Zinc Phosphate Coating on Mild Steel

Authors: Khalid Abdalla, Rahmat Azmi, Aziz Azizan

Abstract: The influence of phosphating temperature on the surface morphology and corrosion resistance of zinc phosphate coatings on mild steel was investigated. The phosphate layers were deposited on steel from phosphating bath at different temperatures (45 ~ 75 C). The surface morphology and composition of phosphate coatings were investigated via scanning electron microscopy (SEM), and energy-dispersive X-ray (EDX). The corrosion resistance of the coatings was evaluated by polarization curves (anodic and cathodic) in an aerated 3.5% NaCl solution. The results showed that the increase in temperature of the phosphating bath up to 55 C caused an increase in surface coverage and in turn resulted in better corrosion resistance. At high temperature (65 °C and 75 °C) the deposition coverage decreased indicating that the best coverage for the phosphate layer on the metal surface was achieved at 55 °C
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Dimensional Effect on DIBL in Silicon Nanowire Transistors

Authors: Yasir Hashim, Othman Sidek

Abstract: Drain-induced barrier lowering (DIBL) is crucial in many applications of silicon nanowire transistors. This paper determined the effect of the dimensions of nanowires

on DIBL. The MuGFET simulation tool was used to investigate the characteristics of the transistors. The transfer characteristics of transistors with different dimensions were simulated. The results show that longer nanowires with smaller diameters and lower oxide thickness decrease DIBL and tend to possess the best transistor characteristics. ...more

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Method of Search and Rescue in Dipterocarp Forest Using GPS Technology

Authors: Nor Wahidah Binte Zailan, S.N. Alsagoff, Nor Fatimah Awang, Mohd Afizi Mohd Shukran

Abstract: Search and rescue has many definition and meanings. According to Ahmed (2006), search and rescue is an operation conducted by personnel of the emergency organizations who is trained and have the skills in search and rescue to find the person (s) in distress or difficult area such as in mountains, deserts, forest or at sea [1]. However, there are a different methods search and rescue that are being used by the different national search and rescue organizations worldwide such as use specialized dog teams, sophisticated listening device, sensing systems and most recently, robots. In this paper, search and rescue that will be conducted are totally different with the methods that already exist. The methodology to generate optimal grid pattern model for search and rescue in dipterocarp forest is proposed with the use of GPS Technology. The SAR team members will be searching of a test area for a test item. They will not know the actual location of the test item. The location of each SAR team will be tracked using GPS Technology. The size and pattern of the search grid and the distance between the SAR team members will be monitored to determine the optimal search grid pattern. If the test item can be found 100% at all times, then the optimal search grid pattern if found. The results must be at 100% because human lives are at stake. ...more

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Real Time Synchrotron X-Ray Imaging for Nucleation and Growth of Cu_6Sn_5 in Sn-7Cu-0.05Ni High Temperature Lead-Free Solder Alloys

Authors: Kazuhiro Nogita, Hideyuki Yasuda, Stuart D. McDonald, Kentaro Uesugi

Abstract: This paper demonstrates how recent progress for real-time solidification observation at SPring-8 synchrotron has contributed to the development of Sn-7wt%Cu-0.05wt%Ni high temperature lead-free solder alloys. Lead-free solder alloys in the composition range Sn-0.7 to 7.6wt%Cu that consist of primary Cu_6Sn_5 in a eutectic Sn-Cu_6Sn_5 matrix have been proposed as solders for application at temperatures up to 400°C for the assembly high current semiconductors. It is shown that trace levels of Al have a marked effect on the solder microstructure and refine the size of the primary Cu_6Sn_5. The solidification pathway that leads to the refinement was observed in real-time using X-ray synchrotron observations. ...more

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Comparison Studies of Blend and Unblend GPE Systems: Ionic Conductivity, Structural and Morphological Properties

Authors: Siti Mariam Samin, Mazwan Mansor, Khairul Bahiyah Md. Isa, Zurina Osman

Abstract: Studies on comparison of blend and unblend PMMA-based gel polymer electrolytes containing $LiClO_4$ salt with EC and PC as plasticizing solvent is reported. The GPE samples are prepared by varying the salt concentrations from 5 wt.% to 30 wt.%. At room temperature, PVdF-HFP/PMMA blend GPE exhibits the highest conductivity of 4.71 x 10^{-3} S cm^{-1} containing 25 wt.% of $LiClO_4$ salt while the highest conductivity for unblend GPE is 3.34 x10^{-3} S cm^{-1} containing 20 wt.% of $LiClO_4$ salt. The amorphous nature and morphological properties between $LiClO_4$ salt, EC and PC in the blend and unblend GPE systems have been validated using XRD and FESEM analysis.
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Ionic Conductivity and Dielectric Properties of Plasticized Polyacrylonitrile Based Solid Polymer Electrolyte Films

Authors: W.G. Chong, Zurina Osman, Lisani Othman, Khairul Bahiyah Md. Isa

Abstract: The conducting polymer electrolyte films composed of polyacrylonitrile (PAN) as the host polymer, $LiCF_3SO_3$ and $NaCF_3SO_3$ as inorganic salts and ethylene carbonate (EC) as plasticizer were prepared by the solution cast technique. The conductivities of the films were characterized by impedance spectroscopy. On addition of more than 14 wt% of salt, the $NaCF_3SO_3$-containing PAN films exhibited higher ionic conductivity than the $LiCF_3SO_3$-containing PAN films. The values of the dielectric constant, ε_r and dielectric loss, ε_i increase as frequency decreases at room temperature. The temperature dependence of the conductivity obeys Arrhenius relation in the temperature range of 303 K to 353 K.
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Investigation of Vanadium Oxide Thin Film Deposited by Sputtering for Electrochromic Applications

Authors: Chien Cheng Liu, Kuang I Liu, Chiung Wen Chang, Hao Tung Lin

Abstract: Vanadium oxide films were deposited on ITO (Indium Tin oxide) glass substrates at room temperature by reactive DC magnetron sputtering. The effect of annealing temperature on composition, microstructure, optical properties, and electrochromic properties of vanadium oxide films were investigated by X-ray diffraction, field-emission scanning electron microscope (FE-SEM), UV-visible spectrometer, and cyclic voltammetry. These films showed (110) crystalline orientation after annealing at 300 °C. V_2O_5 films with more porosity had better electrochromic property and optimal performance after heat treatments.
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Predictive Modeling of TiN Coating Roughness

Authors: Abdul Syukor Mohamad Jaya, Siti Zaiton Mohd Hashim, Habibollah Haron, Muhd Razali Muhamad, Md Nizam Abd Rahman, A. Samad Hasan Basari
Abstract: In this paper, an approach in modeling surface roughness of Titanium Nitrite (TiN) coating using Response Surface Method (RSM) is implemented. The TiN coatings were formed using Physical Vapor Deposition (PVD) sputtering process. N_2 pressure, Argon pressure and turntable speed were selected as process variables. Coating surface roughness as an important coating characteristic was characterized using Atomic Force Microscopy (AFM) equipment. Analysis of variance (ANOVA) is used to determine the significant factors influencing resultant TiN coating roughness. Based on that, a quadratic polynomial model equation represented the process variables and coating roughness was developed. The result indicated that the actual coating roughness of validation runs data fell within the 90% prediction interval (PI) and the residual errors were very low. The findings from this study suggested that Argon pressure, quadratic term of N_2 pressure, quadratic term of turntable speed, interaction between N_2 pressure and turntable speed, and interaction between Argon pressure and turntable speed influenced the TiN coating surface roughness.
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Abstract: The abundant availability of LUSI (a short form of LUmpur SIdoarjo or Sidoarjo mud) mud of a mud volcano located in Sidoarjo, East Java, Indonesia, attracts interest of researchers to seek the possibility of utilizing it; among them is as construction material. This study focuses on the effect of calcinations temperatures of LUSI mud on the compressive strength of geopolymer mortar. Three different calcinations temperatures were investigated, i.e. 700, 800 and 900°C for five hours duration. Characterization of the mud, both the original and the calcined ones, was performed by using X-ray Diffraction (XRD) and X-ray Fluoresence (XRF) analyses. The calcined LUSI mud was then employed as precursor for making geopolymer mortar, and tested for its 7-day compressive strength. It is found that calcinations at 800°C is the optimum calcinations temperature producing the highest compressive strength.
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Abstract: Thermoplastic natural rubber based on epoxidized natural rubber (ENR) and thermoplastic polyurethane (TPU) blend was prepared via dynamic vulcanization process. The main objective is to improve thermal properties of the blends. Two types of antioxidant: phenolic antioxidant (Wingstay®L) and *N*-(1,3-dimethzlbutyl)-*N*-Phenyl-p-

phenylenediamine (6PPD) were used to improve oxidative degradation of the blends. It was found that thermal properties in term of thermal elastic properties and thermal stability can be improved by adding the antioxidants and 6PPD gave the blend with the highest thermal properties. These were measured based on temperature scanning stress relaxation (TSSR) technique. Incorporation of ENR into the TPU caused reduction of the hardness, improved thermal properties, elasticity and oil resistance compared to the neat TPU. These results indicated that the novel high performance TPNRs with high elasticity can be prepared.
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Effect of Modified Natural Rubber on Properties of Thermoplastic Natural Rubber Based on Co-Polyamide Blends

Authors: Boripat Sripornsawat, Charoen Nakason, Azizon Kaesaman

Abstract: Thermoplastic elastomers (TPEs) based on natural rubber (NR)/co-polyamine (COPA) blends with different types of NR (i.e., unmodified NR, MNR, ENR-30 and ENR-50) were prepared using simple blend technique. Mechanical, elastic, oil resistant and morphological properties were investigated. The main objective was to prepare TPEs based on NR with good set property and oil resistance. It was found that the blends with modified NRs exhibited higher moduli, tensile strength, oil resistance and elastic properties than the blend with NR. This is due to higher interaction between functional groups of modified NRs (i.e., ENR and MNR) and COPA. Furthermore, the blends using modified NRs showed finer grain morphology than the blend with NR. This may be caused by higher interfacial adhesion between rubber phase and COPA matrix.
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Comparative Properties of Vegetable Oil-Based Benzyl Esters and Vegetable Oils as Processing Oil in Natural Rubber Compounds

Authors: Hasleena Boontawee, Charoen Nakason, Azizon Kaesaman, Anoma Thitithammawong, Sopa Chewchanwuttiwong

Abstract: The vegetable oil tends to be incompatible and insoluble in the rubber hydrocarbon. They can migrate to the surface of the uncured rubber. To overcome this problem, fatty acid esters that are soluble in rubber material and minimize migration were prepared. Benzyl esters of three different types of vegetable oils (i.e., coconut, palm, and soybean oils) were prepared by reacting fatty acids of vegetable oil with benzyl alcohol. They were then used as processing oil in rubber compounding and processing compared with the one with unmodified vegetable oils. It was found that the benzyl esters of those oils provided the rubber compounds and rubber vulcanizates with superior Mooney viscosity, curing and mechanical properties. Furthermore, better dispersion of filler was observed compared with the rubber compound and vulcanizate with vegetable oil.
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Influence of Processing Oil and Plasticizer on Properties of ENR-25/TPU Simple Blends

Authors: Skulrat Pichaiyut, Charoen Nakason, Norbert Vennemann

Abstract: Thermoplastic natural rubber (TPNR) based on blending of thermoplastic polyurethane (TPU) and epoxidized natural rubber with 25 mol % epoxide (ENR-25) was prepared by simple blend technique. Influence of different types of plasticizer and processing oil (i.e., DOP, TDAE oil and Paraffinic oil) with a fixed loading level of 20 phr was investigated. The main aim was to improve elasticity and lowering the hardness of the blends. It was found that an incorporation of processing oil and plasticizer caused decreasing of mixing torque, mixing temperature, and mechanical properties in terms of tensile strength, and hardness. This is attributed to diffusion of oil or plasticizer molecules into ENR and TPU phases. The oil and plasticizer typically acts as lubricant to promote the ease of flow and influence on various properties. It was also found that an incorporation of processing oil and plasticizer caused decreasing of glass transition temperature (T_g) of rubber and TPU phases, tension set value and Tan δ which refer to greater rubber elasticity and tendency to recover to original shape after prolonged extension. Additionally, the blend with DOP exhibited superior mechanical and other related properties than those of the blends with TDAE oil and paraffinic oil, respectively.
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Shrinkage Characteristics of Green Engineered Cementitious Composites with Varying Palm Oil Fuel Ash Contents and Water-Binder Ratios

Authors: Nurdeen M. Altwair, M.A. Megat Johari, Syed Fuad Saiyid Hashim

Abstract: The present paper is a part of an extensive study on green palm oil fuel ash engineered cementitious composites conducted at Universiti Sains Malaysia. It specifically investigates the effects of waterbinder ratio (w/b) and palm oil fuel ash (POFA) on the drying shrinkage of engineered cementitious composites (ECCs). W/b values of 0.33, 0.36, and 0.38 were selected. ECC mixes were proportioned to have various ratios of POFA ranging from 0 to 1.2 from the mass of cement. The drying shrinkage measurements were taken at 4, 11, 18, 25, 57, and 90 days. The experimental results show that w/b has a significant effect on the drying shrinkage of the ECC mixtures. Drying shrinkage is remarkably reduced with a decrease in the w/b. The results also showed that drying shrinkage of the composites is considerably reduced when POFA is used in the matrix. The measured drying shrinkage strain at 90 days is only 920×10^{-6} με to 1216×10^{-6} με for ECC mixtures with high POFA content. The shrinkage strain of the ECC mixtures without POFA at 90 days is nearly 1597×10^{-6} με to 1910×10^{-6} με.
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Fusion Bonding of Carbon Fiber Reinforced Epoxy Laminates

Authors: Meng Hou

Abstract: Technique of including an amorphous thermoplastic film as the outermost layer of thermoset composites have been developed to join the thermoset composites

using fusion bonding methods. Based on a WLF temperature dependence and a time dependence of $t^{1/4}$, isothermal and non-isothermal models were developed to relate the recovery of bonding strength to welding temperature and time. The isothermal model failed to take into account the time taken for the bonding interface to reach the glass transition temperature and final desired bonding temperature and lacked predictive power for experiments with short bonding times and low shear strength recovery. The non-isothermal model provided an excellent fit to the experimental date, showing a significant improvement over the isothermal model.
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The Effect of Hybridization of the Glass Fiber-Flexible Modified Epoxy and Rigid Epoxy Composite Properties under Low-Velocity Impact

Authors: Siti Nur Liyana Mamauod, Mohd Hanafiah Abidin, Ahmad Zafir Romli

Abstract: In the present study, experiment was carried out to investigate the impact properties of flexible and rigid polymer reinforced with E-glass fiber, under low velocity impact. The experimental work includes preparing the cured glassflexible modified epoxy and placed it onto the uncured glass-epoxy composite samples. The experimental results prove that the hybridization improves the impact strength of laminates. The flexibility segments that were introduced into the epoxy system increased the penetration impact resistance value. Hence more impact energy is required to perforate the samples compared to epoxy composite system which is brittle phase.
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Effects of Feeding Angles and Cutting Speeds of a Mower Knife with Serrated Edges on the Pulverization of Sweet Potato Vines

Authors: Amer N.N. Kakahy, D. Ahmad, M.D. Akhir, Shamsuddin Sulaiman, A. Ishak

Abstract: A study was conducted to test the effects of three different speeds of 1830, 2066 and 2440 rpm of a mower knife with serrated edges and two different feeding angles of 45° and 90° on the pulverization of sweet potato vines. The results indicated that all the treatments were significant at 99% significance level for the pulverized percentage of sweet potato vines remaining on the sieve. The best result was for the 45° feeding angle with lowest vine pulverized percentage of 47.20%. The second speed of 2066 rpm had the finest vine pulverized percentage of 57.47%. The best performance for overlapping effect between feeding angle and speed of mower was achieved by the 45° feeding angle and a mower speed of 1830 rpm resulting in an average percentage of 44.45 % of pulverized vines.
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The Role of Silica Fume in the Adhesion of Concrete Restoration Systems

Authors: Bassam A. Tayeh, B.H. Abu Bakar, M.A. Megat Johari, A.M. Zeyad

Abstract: The weak interfacial transition zone between new and old concrete is always paid much attention and controls many properties of repaired concrete, The present work reports a study on the influence of the silica fume on the adhesion of reactive powder concrete (RPC), as a concrete restoration material, with the ordinary concrete (OC) substrate. The results showed that, the silica fume presence in the interfacial transition zone significantly enhances the adhesion strength between RPC and OC substrate. Furthermore, the silica fume particles consume calcium hydroxide, which is in attendance in the interfacial transition zone, and make the zone more dense, uniform and tough.
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Optimization of Material Removal Rate in EDM Using Taguchi Method

Authors: Milan Kumar Das, Kaushik Kumar, Tapan K. Barman, Prasanta Sahoo

Abstract: This paper presents an investigation on the effect and optimization of machining parameters on material removal rate (MRR) in electrical discharge machining (EDM) of EN31 tool steel. For the experiment, four process parameters viz. pulse on time, pulse off time, discharge current and voltage are considered. The settings of machining parameters are determined by using Taguchis orthogonal array (OA). L_{27} orthogonal array (OA) is considered for the study. The level of importance of the machining parameters on MRR is determined by analysis of variance (ANOVA) test. The optimum machining parameter combination is obtained by the analysis of signal-to-noise (S/N) ratio. The analysis shows that discharge current has the most significant effect on MRR followed by pulse off time and voltage. It is seen that with an increase in discharge current and pulse off time, MRR increases in the studied range. The methodology described here is expected to be highly beneficial to manufacturing industries.
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Corrosion Behavior of AZ91 Mg-Alloy Coated with AlN and TiN in NaCl and Hank's Solution

Authors: Zulkifli Mohd Rosli, Zainab B. Mahamud, Jariah Mohd Juoi, Nayan Nafarizal, Kwan Wai Loon, Yusliza Yusuf, Hairul Effendy Ab Maulod

Abstract: Magnesium alloys create increasing interest in structural application where weight reduction is vast concern. However, its low corrosion resistance especially in atmosphere environment restricts their wide application. In this study, AlN and TiN were coated on AZ91 Mg alloy using PVD magnetron sputtering. AlN and TiN existence is confirmed via grazing angle x-ray diffraction (GA-XRD). The corrosion behaviors of uncoated and coated AZ91 Mg alloy in3.5% NaCl and Hanks solutions were investigated using a potentiostat during electrochemical corrosion test. AlN and TiN coated samples showed better performance in Hanks solution with TiN coated samples have the least corrosion rate (penetration rate=0.040mm/yr and mass loss rate=0.191g/m^2d) in Hanks solution. These create interest to further works on exploring the potential of coated AZ91 Mg alloy in biomaterial application.

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Physical and Mechanical Properties of Glass Composite Material Made from Incinerated Scheduled Waste Slag and SLS Waste Glass

Authors: Jariah Mohd Juoi, Dilip Arudra, Zulkifli Mohd Rosli, A.R. Toibah, Siti Rahmah Shamsuri, Japper Jaafar Azuraien

Abstract: Incineration of scheduled waste and landfilling of the incineration residue (Bottom Slag) is extensively practised in Malaysia as a treatment method for scheduled waste. Land site disposal of Bottom Slag (BS) may lead to environmental health issues and reduces the availability of land to sustain the nations development. This research aims in producing Glass Composite Material (GCM) incorporating BS and Soda Lime Silicate (SLS) waste glass as an alternative method for land site disposal method and as an effort for recycling SLS waste glass .SLS waste glass originates from the urban waste and has been a waste stream in most of the nation whereby the necessity for recycling is in high priority.The effect of BS waste loading on the GCM is studied.Batches of powder mixture is formulated with 30 wt% to 70 wt % of BS powder and SLS waste glass powder for GCM sintering.The powder mixtures of BS and SLS waste glass is compacted by uniaxial pressing method and sintered at 800C with heating rate of 2C/min and 1 hour soaking time. Physical analysis of bulk density, apparent porosity, and water absorption is perfomed according to ASTM C-373 standard. Mechanical testing of microhardness vickers according to ASTM C1327 and Modulus of Rupture (MOR) according to ISO 10545-4 is conducted. Microstructural analysis is carried out using Scanning Electron Microscope and phase analysis by X-ray diffraction method.Phases identified are Anorthite sodian,Quartz,Hematite and Diopside from X-ray diffraction analysis. Higher BS waste loading shows weak physical and mechanical properties .GCM from batch formulation of 30 wt % BS and 70 wt% SLS waste glass has projected optimized physical and mechanical properties. It is observed this batch has projected lowest water absorption percentage of 1.17 % , lowest porosity percentage of 2.2 %, highest bulk density of 1.88 g/cm^3 and highest MOR of 70.57 Mpa and 5.6 GPa for Vickers Microhardness.

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BET Analysis on Carbon Nanotubes: Comparison between Single and Double Stage Thermal CVD Method

Authors: Mohammad Maryam, A.B. Suriani, Muhammad Salleh Shamsudin, Mohamad Rusop

Abstract: Carbon nanotubes have many applications and therefore widely produced. However, it is limited due to the high production cost. In this paper, by preparing the CNTs using the Thermal Chemical Vapor Deposition method, CNTs were synthesized with a low cost method since palm oil is used as the precursor which is a biodegradable and cheap source. The aerosol or spray pyrolysis method is used for single stage and double stage TCVD method. Then, the samples were both collected at deposition temperature of 750°C and were characterized using Brunauer, Emmett and Teller (BET)

method. Since CNTs are said to have high surface area therefore BET method is used to prove this fact. Results showed that by using double stage TCVD method, more CNTs were synthesized compared to single stage TCVD method which produced more impurities namely amorphous carbon. CNTs also have higher surface area compared to amorphous carbon. To support this result, the images of the CNTs produced by same method but different parameters were characterized with field emission scanning electron microscope (FE-SEM) and the raman spectra was determined by the raman spectroscopy characterization.
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Rheological Properties of Zirconia Toughened Alumina Powder for Ceramic Injection Molding

Authors: Sarizal Md Ani, Andanastuti Muchtar, Norhamidi Muhamad, Jaharah A. Ghani

Abstract: The rheological properties of feedstock are critical element to the success of the ceramic injection molding (CIM) process. The suitability of the developed feedstock can be reducing the problems that may arise during injection molding, debinding, and sintering. This study identifies suitable powder loading based on the rheological properties of materials by using a capillary rheometer machine. The feedstock used is a combination of zirconia toughened alumina powder with a binder that consists of high density polyethylene, paraffin wax, and stearic acid. Experimental results showed that all of the feedstocks are suitable for injection molding because of their pseudoplastic nature and low viscosity. However, the low power law index and low activation energy flow of the 57 vol.% powder loading make it most suitable for the CIM process.
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Characterization of TiAlBN Nanocomposite Coating Deposited via Radio Frequency Magnetron Sputtering Using Single Hot-Pressed Target

Authors: Zulkifli Mohd Rosli, Kwan Wai Loon, Jariah Mohd Juoi, Nayan Nafarizal, Zainab B. Mahamud, Yusliza Yusuf

Abstract: TiAlBN coatings have been deposited at varying bias voltage of 0, -60, and-150 V by radio frequency (RF) magnetron sputtering technique. A single hot-pressed Ti-Al-BN target was used for the deposition process. With glancing angle X-ray diffraction analysis (GAXRD), the nanocrystalline (nc-) (Ti,Al)N phase was identified. In addition, the existence of BN and TiB_2 amorphous (a-) phase were detected by X-ray photoelectron spectroscopy (XPS) analysis. Thus, the deposited TiAlBN coatings were confirmed as nc-(Ti,Al)N/a-BN/a-TiB_2 nanocomposite. On the other hand, it was found that optimum bias voltage used in present study is-60 V where the deposited TiAlBN coating exhibits an excellent adhesion quality. The adhesion quality of the coatings deposited at-60V bias voltage is classified as HF 1 evaluated using the Rockwell-C adhesion test method (developed by the Union of German Engineers).
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Effect of Annealing Temperature on Surface Morphology of Lanthanum Phosphate ($LaPO_4$) Nanostructures Thin Films

Authors: A.Z. Zainurul, M. Rusop, Saifollah Abdullah

Abstract: $LaPO_4$ particles with different morphologies and sizes have been successfully synthesized via sol-gel spinned coating process. The aim of this paper is to investigate the effect of annealing on the morphology and formation of $LaPO_4$ on thin films. Physical structural properties of $LaPO_4$ was investigated using atomic force microscopy (AFM-XE100). EDS analysis was done to check on the formation of $LaPO_4$.

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Effect of Multiwall Carbon Nanotubes (MWCNT) on Mechanical and Electrical Properties of PP/C Composites as Alternative Materials for Bipolar Plate Fuel Cell

Authors: Anne Zulfia Syahrial, Sutopo, Bangkit Indriyana, Muhammad Ekaditya Albar, Saeful Rohman

Abstract: The properties of polypropylene can be improved by addition of multiwall carbon nanotube (MWCNT). This research focuses on material design of composite based on polymer matrix and carbon including MWCNT to improve mechanical and electrical properties of composites according to the requirement for bipolar plate material. It is found that the effect of small addition of MWCNT and Cu have been increasing electrical conductivity up to 15.62 S/cm while tensile and flexural strengths increase to 14.97 MPa and 31.78 MPa respectively.

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The Study of the Surface Morphology of PVDF/MgO Nanocomposites Thin Films

Authors: Adillah Nurashikin Arshad, Rozana Mohd Dahan, Mohamad Hafiz Mohd Wahid, Zulkefle Habibah, Nyl Ismail Lyly, Muhamad Naiman Sarip, Rusop Mahmood Mohamad

Abstract: This study investigates the effect of varying loading percentages of MgO on the topography and morphology of Poly (vinylideneflouride)/Magnesium Oxide (PVDF/MgO) nanocomposites thin films. PVDF/MgO nanocomposites spin coated thin films with thicknesses ranging from 200nm to 456nm were successfully characterized. The nanocomposite solutions were spin coated on Al-glass substrates at 1500rpm. The topography and surface roughness of PVDF/MgO nanocomposites were characterized by using AFM. FE-SEM was used to investigate the surface morphology of the nanocomposites thin films and ATR-FTIR was used to determine the chemical bonding of PVDF/MgO nanocomposites. MgO (7%) was found to be the optimum loading percentage for PVDF/MgO nanocomposite film with favorable distribution of MgO particles, minimum defects and high content of β-phase as evident by FESEM and FTIR.

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Surface Modification of Polyvinylidenefluoride-Trifluoroethylene Film Using Argon Gas Plasma

Authors: Rozana Mohd Dahan, Muhamad Naiman Sarip, Seong Ling Yap, Mohamad Hafiz Mohd Wahid, Adillah Nurashikin Arshad, Norlida Kamarulzaman, Dzaraini Kamarun

Abstract: This study investigates the surface properties of plasma surface modified spin coated PVDF-TrFE (70/30) film using Atomic Force Microscopy (AFM), Water Contact Angle (WCA) and X-ray Photoelectron Spectroscopy (XPS). The surfaces of the spin coated PVDF-TrFE film were modified using 13.56 MHz rf Argon plasma. The exposure time of the charged particle PVDF-TrFE films were varied for 1, 3 and 5mins. Prior to modification, the average surface roughness obtained was 8.615nm, but upon modification, the surface roughness was found to increase to 12.466nm. The value of the contact angle of the modified film was reduced from 90^{o} to 43^{o} and the XPS analysis showed dehydrofluorination of PVDF-TrFE films surfaces. The improved in surface roughness and the increased in wettability of the modified film, resulted in good biocompatibility of the modified PVDF-TrFE thin films. This phenomenon has created interest in researchers for developing functional polymer used for applications in areas such are biomedical, bio-analytical assays, textile and even food industry.
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Optical Properties and Antibacterial Bioactivity of ZnO Nanopowder Annealed in Different Ambient

Authors: Chuo Ann Ling, Shahrom Mahmud, Khadijah Mohd Bakhori Siti, Sirelkhatim Amna, Mohamad Dasmawati, Hasan Habsah, Seeni Azman, Abdul Rahman Rosliza

Abstract: Nanomaterials have attracted much attention for their unique properties and promising performance compared to macroscopic materials. Nanotechnology refer to the cutting-edge approach of synthesis and modification of nanomaterials whose structures exhibit novel and improved physical, chemical, biological properties and functionality due to their nanoscaled size [1-2]. The ongoing revolution of the technology has imposed significant impact into several areas of biomedical research and engineering applications. Among the biomedical application include nanoparticle drug delivery, cell imaging, and cancer therapy.
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Effect of Calcinations Temperature on the Structural and Photocatalytic Activity of TiO_2 Powders Prepared by Sol-Gel Method

Authors: Weerachai Sangchay

Abstract: TiO_2 powders were prepared by sol-gel method. The prepared powders were synthesized at the temperature of 200 °C to 700 °C for 2 h with a heating rate of 10 °C/min. The characterizations of synthesized powders were characterized by XRD and SEM. Finally, photocatalytic activity was evaluated by UV-vis spectrophotometer. The results show all samples have the agglomeration. It was found that the effect of

calcinations temperature on phase transformation, crystallite size, morphology and photocatalytic activity of the synthesized powders. It can be note that TiO_2 powders calcined at 700 °C were found to give the highest photocatalytic efficiency (81.7%) under UV irradiation.
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Photocatalytic Activity under UV of TiO_2 Powders Compared with Commercial P25

Authors: Weerachai Sangchay

Abstract: TiO_2 powders were prepared by sol-gel method. The prepared powders were synthesized at the temperature of 500 °C to 700 °C for 2 h with a heating rate of 10 °C/min. The characterizations of synthesized powders were characterized by XRD and SEM. Finally, photocatalytic activity was evaluated by UV-vis spectrophotometer compared with commercial P25. The results show all samples have the agglomeration. It was found that the effect of calcinations temperature on phase transformation, crystallite size, morphology and photocatalytic activity of the synthesized powders. It can be note that TiO_2 powders show highes of photocatalytic activity more than P25 and calcined at 700 °C were found to give the highest photocatalytic efficiency (82%) under UV irradiation 6 h.
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Development of Hydroxyapatite Layer on Superplastic Ti-6Al-4V for Biomaterials Applications

Authors: Adibah Haneem Mohamad Dom, Iswadi Jauhari, Hidayah Mohd Khalid, Zulkifli Mohd Rosli

Abstract: In this study, HA is embedded onto superplastic Ti-6Al-4V through continuous pressing technique at temperature below the allographic temperature to improve the poor bonding strength obtained by the commercial methods. The cross section morphologies of the HA layer show uniform structure without any delamination or cracks at the interface with the surface hardness of approximately 500±5HV. The EDX and line scan analysis shows that interfacial reaction occur between the HA layer and the substrate. Wear test evaluations show that embedded layer on superplastic Ti-6Al-4V substrate can withstand higher pressure compared to the as-received substrate.
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Evaluation of Silica Fume Effect on Compressive Strength of Structural Lightweight Concrete Containing LECA as Lightweight Aggregate

Authors: Maryam Mortazavi, Mojtaba Majlessi

Abstract: The purpose of this paper is to evaluate the effect of silica fume on compressive strength of structural lightweight concrete, containing saturated LECA (Light Expanded Clay Aggregate) as lightweight aggregate (LWA). In experimental phase of study 120 cubic specimens (10*10*10) were made and cured. For every mix design, different cement percentages were replaced with silica fume, containing same

amount of saturated LECA. The mixes incorporate 0%, 5%, 10%, 15%, 20%, 25% silica fume. Constant level of Water/Cement ratio (0.37) was considered. For each mix design 20 specimens were prepared and cured for 7, 14, 28, 42 days in standard 20 C water. Also 20 specimens with the same mix design of 0% silica fume as normal weight concrete were prepared and cured to compare the results. For these specimens LECA were replaced with same volume and size of sand. The testing results showed; increasing silica fume causes considerable increase in compressive strength. The rate of strength gain slows down at high percentage of silica fume. Also silica fume leads concrete to get higher initial compressive strength at certain time compared with normal weight concrete.
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Improvement of Hydrophobicity of Urea Modified Tapioca Starch Film with Lignin for Slow Release Fertilizer

Authors: Sarwono Ariyanti, Zakaria Man, Mohammad Azmi Bustam

Abstract: Tapioca starch was chemically modified with urea in the presence of borate as crosslinker and catalyst. Fourier transform infrared (FTIR) and viscosity were performed to measure qualitatively the reactivity of the mixture. To improve the hydrophobicity, 10% of lignin (10%L) was then added into the starch-urea-borate (SUB) system. The incorporation of lignin leads to lower water uptake film. It was found that lignin retards the urea release and the SUB10%L film is stable and stayed intact for one month after immersing in water which shows high potential as a biopolymer for slow release fertilizer.
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Quantitative Evaluation of the Relationship between Tensile Crack and Shear Movement in Concrete Beams

Authors: Shahiron Shahidan, Rhys Pullin, Karen M. Holford, Norazura Muhamad Bunnori, Md Nor Noorsuhada

Abstract: This paper investigates the use of acoustic emission (AE) to identify tensile cracks and shear movements in concrete structures. The analysis of AE signals detected during a concrete beam investigation mainly focused on the relationship between signal parameters namely rise time, amplitude, duration and counts. This method allowed crack classification and shear movements to be identified. A laboratory experiment test was completed on a reinforced concrete beam (150 x 250 x 1900 mm). During testing AE data was captured and analysed post-test. Results from the most severely damaged zone, based on visual inspection, was analysed. The results indicated that tensile cracks developed though out the area of analysis, as confirmed by visual observation and relatively little shear movement occurred as would be expected in a reinforced beam.
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Effect of Soya Bean Flour Content on Mechanical Properties and Biodegradability of Poly(vinyl Alcohol) Film

Authors: Fairus Mazlia Mat Suki, Hanafi Ismail, Zuratul Ain Abdul Hamid

Abstract: Biodegradable film blends of soya bean flour with poly (vinyl alcohol) (PVA) were prepared by solution mixing and solution casting. The main goal of this study is to investigate the effect of soya bean flour content in the PVA film. Mechanical properties of the obtained blends were assessed by tensile testing, whereas the biodegradability were assessed by subjected the films in natural weathering. The incorporation of soya bean flour decreased the tensile strength and elongation at break of PVA film. However, the tensile modulus increased with the addition of soya bean flour. The reduction in tensile properties of the PVA/soya bean flour blend films revealed that the presence of soya bean flour show positive effect in degradation.

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Effect of Natural Antioxidants on Curing Characteristics and Crosslink Density of Natural Rubber Vulcanisate

Authors: N.H.H. Shuhaimi, N.S. Ishak, Nadras Othman, Hanafi Ismail, S. Sasidharan

Abstract: Oil palm leaves is a waste material. Phenolic compound was extracted from oil palm leaves and know as natural antioxidant that could possibly used in natural rubber compound. The present study involves the effect of natural antioxidants that obtained from oil palm leaves on cure characteristics and crosslink density of natural rubber vulcanisate. The natural rubber had been cured at 160°C in three different vulcanization systems which were conventional (CV), efficient (EV) and semi-efficient (SEV). The cure characteristic was been conducted by using Mosanto Rheometer at 160°C for 30 minutes. For swelling test, the specimens were immersed in toluene solvent for 22 hours. The specimens were weighed before and after immersed. CV system showed better result in M_{90} and curing rate due to higher degree of crosslinking as compared to SEV and EV system. Meanwhile, EV and SEV system showed comparable result in crosslink density with CV system. This is due stronger bonding between monosulphide crosslink. Finally, the results indicated that natural antioxidant has a tendency to substitute commercial antioxidant (TMQ) in the rubber field.

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An Overview Current Application of Artificial Neural Network in Concrete

Authors: Sakhiah Abdul Kudus, Norazura Muhamad Bunnori, Siti Ramziah Basri, Shahidan Shahiron, Mohd Nazli Md. Jamil, Md Nor Noorsuhada

Abstract: This paper presents the overview of aArtificial Neural Network (ANN) in the scope of civil engineering application. ANN is one of the artificial intelligence (AI) applications which are currently one of the effective methods used by engineers and researchers to solve technical problems in many scopes of engineering field. One of the explicit criteria of ANN is the ability of the network to deal with the incomplete data and

have the capability of learning from experience. This network is also able to adapt to new and changing situation or environment.
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Influence of Waste Paper Sludge Ash (WPSA) and Fine Recycled Concrete Aggregate (FRCA) on the Compressive Strength Characteristic of Foamed Concrete

Authors: Siti Shahidah Sharipudin, Ahmad Ruslan Mohd Ridzuan

Abstract: In the effort to produce sustainable concrete, considerable attempt has been placed on replacing the main ingredients in concrete mixtures with more sustainable materials with the objective to reduce the carbon footprint. One of the replacement materials is waste paper sludge ash (WPSA), a local industrial by-product generated abundantly by newsprint mills which possesses considerable cementitious properties. Parallel to this, the high amount of construction waste, particularly concrete waste has become a difficult environmental issue to cope with in todays world. For this reason, recycling of concrete waste as a new alternative aggregate is being effectively utilized in concrete production. Thus, this paper reports on a study conducted to evaluate the compressive strength characteristics of the potential of using WPSA as a binder and fine recycled concrete aggregate (FRCA) as a virgin sand replacement in producing foamed concrete. The findings of this study exhibited that the inclusion of WPSA and FRCA for replacement ratios up to 20% and 15% respectively has significantly influenced the strength properties of foamed concrete.
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Numerical and Experimental Studies on Extrusion of Fan-Shaped Shell of Magnesium Alloy

Authors: Bao Hong Zhang, Yao Jin Wu, Zhi Min Zhang

Abstract: This paper presents a case study of optimizing the forming process for a fan-shaped shell component. Numerical simulation was used to study the backward extrusion process of a fan-shaped shell. The underfill defect produced at the opening of the extruded shell due to the billet shape was solved and the minimal base thickness required to avoid the presence of the underfill defect at the bottom corner of the component was defined through the numerical simulation. The extrusion drawing and forming process of the fan-shaped shell were designed on the basis of the results of the numerical simulation. Forming experiments had been performed on the fan-shaped shell at 380 °C and cracking was found on the outside wall in the center of the extruded shell. Choked groove on the inner wall of the die and reducing the lubrication had been used to avoid the presence of cracking. The fan-shaped shell of AZ31 magnesium alloy has been successfully formed by the three-stage forming process of hot upsetting, hot backward extrusion and cold sizing.
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Effects of Homogenizing and Extrusion on Elongation of As-Cast AZ80 Magnesium Alloy

Authors: Yao Jin Wu, Bao Hong Zhang, Yong Biao Yang, Zhi Min Zhang

Abstract: This paper presents the results of an investigation of the effects of homogenizing heat treatment and extrusion on plasticity of the as-cast AZ80 magnesium alloy. Both the homogenized and non-homogenized billets of AZ80 alloy were forward extruded at several different temperatures and different extrusion ratios. The effects of homogenization and extrusion on plasticity were evaluated by conducting tensile tests on these billets at room temperature and comparing their elongations. The experimental results showed that the elongation of the as-cast AZ80 alloy was increased by 67% after the homogenization treatment. After extrusion, the elongation of both the homogenized and non-homogenized AZ80 alloy increased significantly. The elongation of the homogenized billets decreased gradually with increasing temperature. For the non-homogenized billets, however, the elongation decreased sharply with temperature from 300 to 350 °C and then increased gradually with increasing temperature. There was not clear correlation between the elongations of both the homogenized and non-homogenized billets and the extrusion ratio.

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The Influence of Fly Ash Addition on the Compressive Strength of Concrete Containing Recycle Concrete Aggregates

Authors: Rosyid Kholilur Rohman, Setiyo Daru Cahyono, A.R. Hanung Triyono

Abstract: The rapid economy growth in Indonesia encourages the developments in all fields. One of them is the development of infrastructure on housings, transportations, and irrigation. Constructions of concrete building are used on the road, bridges, buildings, housing, and water buildings. A concrete is a material structure of building that made from mix of sand, gravel, cement and water as adhesive. All the materials of the concrete were derived from the nature. To avoid the excessive exploration of nature resource the method of recycling of used concrete to become new one were needed. The used concrete was used for coarse aggregate. To improve the quality of concrete from the used one, additional material was required, that is, fly ash. The test material were formed of cube of 15x15x15 cm in size. From the result of research, the analysis can be done in order to find the relationship between quantity of fly ash to be added and the quality of concrete can be formulated as $y = -34.921x^2 + 11.45x + 25.465$, in which *y* is compressive strength and *x* is the percentage of fly ash. Thus, for maximum addition of fly ash of 16.4 %, it obtains the maximum compressive strength of concrete of 26.4 MPa and the age of concrete is 28 days. The method of recycling of used concrete and the use of fly ash to become the material of new concrete are safe environmentally, which can overcome the nature filthy especially from the waste of used concrete and coal. Therefore, this is in line with the principal of nature preservation, those are Reduce, Reuse dan Recycle.

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Investigation of the Geometry Modeling of Metal Organic Halide Vapor Phase Epitaxy (MOHVPE) Reactor

Authors: N. Zieyana Mohamed Annuar, Mohd Faizul Mohd Sabri, A. Shuhaimi Abu Bakar

Abstract: The new approach for designing a horizontal metal organic halide vapor phase epitaxy (MOHVPE) reactor chamber is proposed. The model is conjugated with comprehensive detailed simulation for horizontal tube reaction chamber by using computerized software. The modeling approach is based on the hybridization of MOCVD and HVPE. The development consists of 5 inlet nozzles with dimension of 54 cm long. The numerical study of horizontal MOHVPE growth shows dependence on temperature and species flow rates. The inlet area is set to room temperature while the whole chamber is set in the temperature range from 1273 K to 1473 K. It is seen that the flow pattern is influenced more by the temperature distribution and geometry of the chamber.

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CdSe Thin Film by Using Spin-Coating

Authors: C.H. Rosmani, S. Abdullah, Mohamad Rusop

Abstract: CdSe thin film was prepared by using spin coating method .The surface morphology of CdSe thin films can be used as the main material in solar cells application, by using sodium selenosulfate as a selenium source and cadmium chloride as cadmium precursor. The solution for each sample had with different molar ratio of cadmium chloride and sodium selenosulfate to know the comparison between the samples. The spin for each samples were constant parameter with 3000 rpm at 30 seconds and dry in ambient temperature. The characterization using atomic force microscopy (AFM) to know the surface morphology of CdSe thin film. The important thing in this paper was to know the surface morphology of CdSe thin films as the comparison with other experiment for solar cells application.

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Effect of Steel and Alkaline-Resistance Glass Fibre on Mechanical and Durability Properties of Lightweight Foamed Concrete

Authors: Muhammad Hafiz Ahmad, Hanizam Awang

Abstract: This paper investigates the effect of steel fibre and alkaline-resistance glass fibre lightweight foamed concrete with fly ash inclusion towards mechanical and durability properties. The lightweight foamed concrete (LFC) with a density of 1000 kg/m^3 with constant water sand ratio of 1: 1:5 and water cement ratio of 0.45 was cast and tested. Steel and alkaline-resistance glass fibres were used as additives and 30% of cement was replaced by fly ash. Detail experiments were setup to study the behaviour and reaction of additives which is expected to give different results on mechanical and durability properties of LFC. Compared to AR-glass fibre, steel fibre has greater contribution in terms of mechanical properties. SFLFC resulted as the most effective approach for compressive, flexural, tensile split and water absorption with

strength 6.13 N/mm^2, 1.96 N/mm^2, 1.52 N/mm^2 and lowest water absorption at 6.5% respectively. On the other hand, AR-glass fibre is better in controlling drying shrinkage which leads to controlling the cracking at early age. Fly ash does not change the mechanical properties and durability due to unprocessed stage to its finer forms.
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A Novel Porous-Polymer-Supported Ru(II)-*dm*-Pheox Catalyst and its Application in Highly Efficient N-H Insertion Reactions

Authors: A.M. Abu Elfotoh, H.W. Chua, S. Murakami, K. Phomkeona, K. Shibatomi, S. Iwasa

Abstract: A novel macroporous polymer supported ruthenium (II) dimethyl phenyloxazoline (Ru (II)- *dm*-Pheox) catalyst has been developed by crosslinking polymerizing monomeric Ru (II)-*dm*-Pheox complex with styrene and 1,4-divinyl benzene (DVB) in the presence of 2,2-azobisizobutyronitrile (AIBN) and water. We evaluated the catalytic activity of our novel porous catalyst in the intermolecular N-H insertion of the commercially available ethyl diazoacetate (EDA) with various amines. The polymer supported catalyst showed excellent catalytic reactivity by delivering the amino acid derivatives in high yields after centrifugation.
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Viscosity Effect on Piezoelectric Actuated Nozzle in Generating Micro Droplet

Authors: Ibrahim Raman, M. Syafiq, N. Sa'ude, Mustaffa Ibrahim, Wahab Saidin

Abstract: nkjet printing has proven to be a promising and flexible process methodology for low cost and drop-on-demand pattern formation in small-scale devices with a functional material. In this paper, micro droplet deposition using 80 micron diameter nozzle with micro piezoelectric printhead was investigated using a mixture of three fluids, distilled water (DW) and solutions of two different percentage of glycerine (G) as an operating fluids. The droplet formation capability and stability was studied according to the influence of pulse amplitude, dwell time and fluid viscosity. The results show that the optimal drop velocity to obtain a stable printing range from 0.5 ~1.5 ms^{-1} which corresponds to pulse amplitude range of 25 to 100V and dwell time 15 to 35 μs. Respectively droplet formation and dispensing performance give benefit in dispensing application and build a solid background to inkjeting functional polymer material.
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Parameter Optimerization for Photo Polymerization of Microstereolithography

Authors: K. Khairu, Ibrahim Raman, Mohammad Asraf Shaik Mohamed, Mustaffa Ibrahim, Wahab Saidin

Abstract: This paper presents a research on composition photo absorber (Sudan I) effect based on curing parameter, the Liquid Crystal Display (LCD) projector as energy light source initiated the photo reactive polymer. The polymer based material with

composition of 1, 6-Hexanediol dicrylate, Phenylbis (2,4,6-trimethylbenzoyl) phosphine oxide with varied Sudan I concentration was used to build 3D structures. The structure was fabricated with three different photo absorber concentrations 0.002%, 0.003%. and 0.006%. of Sudan I. In this experiment the photoreactive polymer solidification phenomena was evaluated.The experiment result obtained, that exposed time of the varied photo absorber was most significantly affect the surface roughness values and the solidification layer time regardless the layer thickness. This work represents that photo absorber composition solution gave a different characteristics for 3D microstructure fabrication.
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Characterization of Titanium Dioxide Nanopowder Synthesized by Sol Gel Grinding Method

Authors: N.N. Hafizah, Mohamed Zahidi Musa, Mohamad Hafiz Mamat, M. Rusop

Abstract: In this study, TiO_2 nanopowder was synthesized via a sol-gel grinding method. The effects of TiO_2 precursor concentration of TiO_2 nanopowder were investigated. The TiO_2 nanopowder obtained were characterized using X-ray diffraction (XRD), Raman spectroscopy and field emission scanning electron microscopy (FESEM) for their structural properties. From the calculation of the crystallite size in XRD, the size of the nanoparticles obtained is 49.55 nm at the highest TiO_2 precursor concentration. In contrast, at the lower concentration of 0.4 molar give the cryatallite size of 12.84 nm. Further, XRD and Raman spectrum results confirmed the TiO_2 nanopowder obtain composed of only anatase phase. The FESEM micrographs of TiO_2 nanopowder also were discussed in this paper.
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Effects of Cobalt Addition and Temperature on Microstructure and Density of W-25Cu Composites Prepared via Liquid Infiltration

Authors: Ibrahim Hafed, Aziz Azizan, Rahmat Azmi

Abstract: In this study, the effect of Co and sintering temperature on microstructure of W-25Cu composites prepared via copper melt infiltration has been investigated. The concentration of Co addition used ranged from 0.5 to 3wt. %. The infiltration temperatures were performed at 1150°C and 1250°C for 2 hr under vacuum. The microstructure and sintering density of W-25Cu composites are discussed. Results indicated that, the relative density (RD) and microstructure of W-25wt. % Cu were greatly affected by the addition of low Co concentration and sintering temperature. The concentration of 3 wt. % Co to tungsten-copper compact and infiltration temperature of 1250°C give high sintering density of 98.6% theoretical density (TD). The concentration of Co and infiltrating temperature have strong effects on the densification of W-Cu composite materials. The sintered compact microstructures and density were obtained using scanning electron microscope (SEM) coupled with EDX and Archimedes technique respectively.
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Investigation on Fabricating High Aspect Ratio Microholes on Silicon by FIB/SEM Milling

Authors: Fatin Syazana Jamaludin, Mohd Faizul Mohd Sabri

Abstract: The aspect ratio of microholes milled on silicon by FIB/SEM milling was investigated with various beam currents and initial depths of mill. Lower beam current gives finer surface and more accurate structure. The results showed that the highest depth of microhole fabricated using FIB/SEM milling was 17.45µm, and maximum aspect ratio 1:8, without using gas injection system (GIS). The value of depth obtained was less than the initial depth of mill due to re-deposition, influenced by low sputter yield of silicon. Milling time and dwell time play important roles in milling process to get high aspect ratio of microholes.

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A Study of Unmanned Aerial Vehicle Photogrammetry for Environment Mapping: Preliminary Observation

Authors: Munirah Radin Mohd Mokhtar, Abdul Nasir Matori, Hj Khamaruzaman Hj Wan Yusof, Imtiaz Ahmed Chandio, Duong Tuan Viet, Dano Umar Lawal

Abstract: This paper presents the preliminary work is a part of a research focusing on close range photogrammetry for landslide monitoring.The main objective of this paper is to present the Close Range Photogrammetry (CRP) technique, Unmanned Aerial Vehicle (UAV) will provide a platform to monitor the surface area This method was applied using the capabilities and power of Gatewing, Unmanned Aerial Vehicle (UAV) for data capturing with respect to UAV tracking conducted in UTP, Tronoh, Perak, on 15th March 2012 at 150m height. The Gatewing is designed for rapid terrain mapping with fully automated image processing. The result proves that data processing were conducted by Srecthout Software. Flight planning was carried out on site, where the areas to be observed are situated inside the UTP campus. The paper focus on final production of an orthomosaic. In conclusion, it is demonstrated that Gatewing, UAV is the best, fast and powerful mapping vehicle for close range photogrammetry application in future works. It shows highly excellent performance compared to other UAVs already established in the market today. Keywords: Unmanned Aerial Vehicle (UAV); Close Range Photogrammetry (CRP); Gatewing; orthomosaic; terrain.

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Microstructural Evolution in Partially Homogenized AZ91 Alloy during Hot Rolling and Interpass Annealing

Authors: Mahmoud Reza Ghandehari Ferdowsi, Mohammad Mazinani, Gholam Reza Ebrahimi

Abstract: The as-cast AZ91 Mg alloy ingot with mean grain size of 98 µm after solution treatment was subjected to plastic deformation by multi-pass hot rolling. The process facilitated steady grain refinement by dynamic recrystallization with increasing rolling passes, and the final grain size was reduced to 6.4 µm by 4 rolling passes. Optical

microscopy demonstrated that in the beginning of the rolling process twin DRX was the major dynamic recrystallization mechanism. In contrast, in 3rd and 4th passes of rolling new grains nucleated at grain boundaries, due to low grain size of the alloy.
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The Influence of AlkaliTreatment and Compatibilizer Addition on the Tensile Properties and Water Absorption Behavior of Polypropylene/Kenaf Fiber Composites

Authors: Razaina Mat Taib, Nurul Mujahidah Ahmad Khairuddin, Zainal Arifin Mohd Ishak

Abstract: Composites of polypropylene (PP) and kenaf fiber (KF) were immersed in water at room temperature. The fiber was treated with alkaline solution. A compatibilizer, maleic anhydride-grafted polypropylene (MAPP) was added in some composite formulations. Composite with alkali treated fibers (KFA) showed similar tensile strength but lower tensile modulus than the composite with untreated fiber, KF. Addition of MAPP was crucial to improve the tensile properties and water resistance of either PP/KF or PP/KFA composites. Alkali treatment adversely affected the water absorption behavior of PP/KF composite.
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Role of Salt Concentration Lithium Perchlorate on Ionic Conductivity and Structural of (Glycidyl Methacrylate-co-Ethyl Methacrylate) (70/30) Based on a Solid Polymer Electrolyte

Authors: M. Imperiyka, Azizan Ahmad, S.A. Hanifah, Mohd Yusri Abdul Rahman

Abstract: A new solid polymer electrolytes (SPE) comprising copolymer of poly(glycidyl methacrylate, GMA) and (ethyl methacrylate, EMA) as polymer host and $LiClO_4$ as dopant was prepared by solution-casting technique. The copolymer was prepared by photopolymerization method and was characterized using NMR. The SPEs were characterized using electrochemical impedance spectroscopy (EIS), fourier transforms infrared (FTIR) and X-ray diffraction (XRD). The highest conductivity achieved was $4.0x10^{-4}$ at 373K with highest conductivity at room temperature ($2.7x10^{-}5$ S cm^{-1} at 30 wt. % of $LiClO_4$). The active coordination site for the cation (Li^+), three electrons donating functional carbonyl, ether and epoxy group of the GMA-co-EMA host have been evaluated base on their properties that were recorded in (FTIR). The structural analysis showed reduction in copolymer crystallinity phases at its highest conductivity
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Simulation and Analysis for Harvesting *Dioscorea hispida* Tubers

Authors: M.A.H.A. Ssomad, R.M. Hudzari, M.N.A. Noordin, S.J. Abdullah, S.M. Sapuan, S. Hassan

Abstract: This study discussed an analysis and simulation of fixture stand structure that will use for data collection of force required for harvesting the tubers of *Dioscorea hispida*. The tubers were surrounded by roots which were well gripped to the soil which

made harvesting process difficult. Therefore, a new tool fixture equipped with digital force gauge device to gripped stem *dioscorea hispida* is required. Imada digital force measurement gauges are state-of-the-art, instruments capable of the highly accurate measurements required in quality testing to determine the strength or functionality of a part or product. The information from the experiments is used to model and simulate the tool in Computer Aided Design (CAD) environment. The solid modelling software Solidworks was used for the design, modelling and simulation of the equipment and the finite element analysis to determine the stress affected on various fixture designs.
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Development of Novel Detection Device for Chemical Properties of *Dioscorea hispida*

Authors: R. Syazili, R.M. Hudzari, Ain M. Kamarul, A.B.C. Abdullah, M.A.H.A. Ssomad

Abstract: The potential of machine vision application in the determination of alkaloid in *Dioscorea hispida* rhizome was explored. A camera vision system used in this research is chroma meter CR-400 made by Konica Minolta. The first component is the hardware component that functions as an image acquisitioned for the system. The second component is the software part which converts reading obtained from the hardware. From the design review, the images from a variety of harvested of *Dioscorea hispida* will be captured and the reading in L*a*b color space were converted. The prediction was also made on the statistical relationship between Hue and dioscorine level in the fruit. With the same rhizomes, 40 grams was selected for chemical analysis at a laboratory for the programme of East Coastal Economic Regions Kementerian Pengajian Tinggi, Universiti Sultan Zainal Abidin, Malaysia (ECER-KPT UniSZA). The samples were selected from 12 portions of 2 plants (I and B) collected from Kampung Kudat, Ajil, Terengganu, Malaysia. The development on this study is grouped as non destructive method to determine the dioscorine content which is one of the alkaloid components in the rhizome of *Dioscorea hispida*.
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The Factors Affecting the Swelling of W–Bronze Composite System at Different Sintering Conditions

Authors: M.S. Kahtan, Rahmat Azmi

Abstract: During sintering of Wbronze metal matrix composites, the difference in the interdiffusuion path, sintering atmosphere and alloying element might be the source of the swelling phenomenon. In this study, the factors lead to swelling of Wbronze sintered compacts were investigated. To achieve this goal, two swelled groupes of Wbronze sintered compacts were examined. The first group was compacts of ball milled powder with activator additions and the second group was compacts of ball milled powder infiltrated by bronze melt. The latter type showed the severest level of swelling. Sintered density measurements, X-ray diffraction analysis (XRD), scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDS) were incorporated to clarify and

predict the reasons standing behind the swelling of the Wbronze sintered compacts.
Key words: swelling, diffusion path, grain size, sintering activator
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Isolation and Characterization of Cellulose Producing Bacterial Strain from Orange Pulp

Authors: Neha Tyagi, Sumathi Suresh

Abstract: Cellulose producing bacterial strain was isolated from orange pulp. The isolated strain was identified to be *Gluconoacetobacter intermedius NT* based on several morphological characteristics, biochemical tests and 16S r-DNA analysis. Bacterial cellulose production by the isolated bacterial strain was maximum in Hestrin and Schramm (HS) and modified HS media (8.5 and 10 g /L, respectively) following cultivation under static conditions for 10 days. Modified HS medium containing 40 ml/L of heat pre-treated molasses as the sole source of carbon facilitated significant production of cellulose (3.5 g/L) by the bacterial isolate. Utilization of molasses as the carbon source for the production of bacterial cellulose would have an advantage over pure sugars from the commercial point of view.
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Effect of Voltage and Suspension Medium on Stanum Oxide (SnO_2) Film Prepared by Electrophoretic Deposition (EPD)

Authors: Hariati Taib, Siti Alwani Binti Ab. Aziz

Abstract: The electrophoretic deposition (EPD) technique was applied in order to produce stanum oxide (SnO_2) coating on stainless steel. Voltages of 2V, 4V, 6V and 8V and two types of SnO_2 suspensions; (i) acidic (pH 3) and (ii) alkaline (pH 10) were studied. Depositions were carried out for duration of 10 minutes. It was found that weight of coatings produced using both acidic and alkaline SnO_2 suspensions increased proportionally with increasing voltage. However, the morphology of coatings in acidic SnO_2 was observed to yield better SnO_2 depositions through the EPD technique.
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Evaluation on the Thermal Conductivity of Sand-Cement Blocks with Kenaf Fiber

Authors: Aimi Munirah Jalilluddin, Seti Mariam Ayop, Kartini Kamaruddin

Abstract: Mechanical means of ventilation and air-conditioning system in Malaysian buildings are used continuously to provide and maintain the comfort of indoor environment to the occupants of the buildings. It was found that the system used led to higher rate of energy consumption. Hence, development of masonry units with high thermal insulation properties is a necessity. This paper represented the study on the thermal conductivity and the density of sand-cement blocks incorporated with different proportions of kenaf (*Hibiscus cannabinus L.*) fiber as additive. The amount of kenaf fiber inclusions were the main focus to observe the achievement of best results for both properties. It was found that kenaf fiber content had an advantage to reduce the self-

weight of blocks whilst reducing the thermal conductivity property. Hence, it can be seen that there is a potential in developing masonry units for single wall components in Malaysian buildings with lightweight features and thermal insulator properties.
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Comparison between the Nominal Loss in 3%SiFe and Amorphous Transformer Core Materials

Authors: Dina Maizana, Shuhaimi Zakaria Abdullah

Abstract: An investigation of nominal loss in 3%SiFe and amorphous of the transformer core materials will evaluate in this paper. The investigation involves the variation of power loss, flux leakage, and total harmonic distortion. The nominal loss has been measured using Epstein test frame with three layers of lamination. The loss in the amorphous transformer core material is 57.46% better than the transformer core with 3% SiFe material at flux density of 1.2T, 50 Hz. The flux leakage at corner in the 3% SiFe transformer core material is the lowest than the two of transformer core material, over the whole flux density range. Total harmonic distortion flux is the largest in the amorphous of transformer core materials and the smallest in the 3% SiFe of transformer core material. Using the amorphous material in transformer core is more efficient than the two of transformer core materials.
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Synthesis of Polylactic Acid from Fermentative Lactic Acid by Direct Polycondensation for Materials Application

Authors: Lalita Ponmanee, Chiravoot Pechyen, Sarote Sirisansaneeyakul

Abstract: Polylactic acid (PLA) is one of the major commercially available polymers which widely used in the food packing materials, fibers, agricultural films and biomaterials. PLA synthesis was carried out in a direct polycondensation with *p*-toluenesulfonic acid (PTSA) as a catalyst. The fermentative lactic acid prepared from *Lactobacillus rhamnosus* TISTR 108 was used as a monomer of polymerization. In addition, the number average molecular weight (M_n) and molecular weight (M_w) of PLA products were analyzed by end-group analysis and High Performance Liquid Chromatography (HPLC). The results indicated that only low molecular weight of PLA could be successfully produced from fermentative lactic acid by direct polycondensation under appropriate conditions; 0.25 wt% PTSA as catalyst, temperature at 170 °C and polymerizing time for 7 hr. The number average molecular weight (M_n) and molecular weight (M_w) of the PLA products were 2,627 and 232 Da, respectively. Furthermore, PLA products were formed as a film with blending of PLA synthesized from fermentative lactic acid and commercially available PLA by using solvent casting method. As a result, fermentative lactic acid is a new alternative substrate for PLA synthesis which contributes to the reduction of production cost, increasing the renewable resources value, and development of bioplastic environmentally friendly materials.
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Misfit Dislocation Reduction of $In_xGa_{1-x}N$/GaN Heteroepitaxy Using Graded Layer

Authors: Anisul Islam, Durjoy Dev, Md. Arafat Hossain, Md. Rafiqul Islam, A. Yamamoto

Abstract: The performances of heterostructural devices are often limited by misfit dislocation. In this paper, a theoretical approach for misfit dislocation reduction of wurtzite $In_xGa_{1-x}N$/GaN is presented. The linear and exponential grading techniques have been modeled for the reduction of dislocation. An energy balance model has been taken into consideration and modified for wurtzite structure to evaluate the misfit dislocation density. The value of misfit dislocation has been reduced from 7.112×10^{10} cm^{-2} to 6.19×10^{6} cm^{-2} and 7.039×10^{10} cm^{-2} to 6.121×10^{6} cm^{-2} at the plane 1/3<> {} and 1/3<>{} respectively for linear grading. In case of exponential grading the dislocation density has been reduced to 2.762×10^{5} cm^{-2} for both slip systems. Because of tapered grading coefficient a tapered dislocation profile has been reported in case of exponential grading technique. Finally, a comparative study has been shown among without graded, linear and exponential grading.

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Char Strength of Wool Fibre Reinforced Epoxy-Based Intumescent Coatings (FRIC)

Authors: Norlaili Amir, Faiz Ahmad, Puteri S.M. Megat Yusoff

Abstract: Fire protective intumescent coating cannot insulate a base material effectively if its char lacks mechanical strength. This research therefore, studied the effects of fibre reinforcement to epoxy-based intumescent coatings char strength. The fibres used include glass wool fibre, Rockwool fibre and ceramic wool fibre of 10mm length. The three formulations mechanical performances were compared to both, a famous commercial intumescent coating and a control formulation without fibre. These coatings were fire tested up to 800°C in an electric furnace for an hour. Their chars mechanical properties were evaluated for char resistance test using predetermined weight loads. In the test, masses from 100g to 3600g were loaded continuously on top of the chars where the fibre reinforced intumescent coating (FRIC) has shown better strength and resistance to deformation. As a result, they produced lower percentage of height reduction i.e. 34% - 83% different when compared to unreinforced coating. Control char also ruptured at as low as 4N load. It was deduced that fire insulative wool fibres are effective reinforcement for improved char strength of the FRIC.

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Co_2 Solubility in Silica Supported [hmim][Tf_2N]

Authors: Mat Dagang Nurul Safiah, Mohammad Azmi Bustam, Normawati M. Yunus, Zakaria Man

Abstract: Solid supported ionic liquids can be used to overcome the high viscosity issue of ionic liquids and help increase the efficiency of CO_2 removal. In this research, [hmi [Tf_2 was impregnated into porous silica dioxide (SiO_2) and characterized using Porous

and Surface Analyzer, Thermogravimetric Analysis (TGA) and Spectroscopy RAMAN. The CO_2 solubility was measured at different pressure at room temperature. The mole fraction of CO_2 captured was increased as the pressure increased, and the highest mole fraction was at 40 bar. The mole fraction of CO_2 captured at 40 bar for SiO_2-[hmi [Tf_2 was 0.812 which was higher compared to pure [hmi [Tf_2, with mole fraction of 0.650. Henrys Law Constant (K_H) was higher for SiO_2-[hmi [Tf_2 with 26.8±5.2 bar while for [hmi [Tf_2, the K_H was 35.4±3.3 bar.
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Stability of Created Nano-Holes from Electrodeposited Organic SAMs (Thiols) on Gold Polycrystalline Films

Authors: Mokhtar Zabat, Mario Morin

Abstract: Self-assembled monolayers $CH_3(CH_2)_{n-1}SH$ with different chain lengths have been elaborated by electrodeposition on gold films. Enhanced blocking properties were obtained by sweeping the potential between oxidative and reductive regions. Once complete and almost defects free layers were obtained, partial reduction was found to lead to the creation of almost circular nanosized holes in the SAMs; which can be used as nanoelectrodes. As verified by the EIS analysis of the charge and the mass transfer through the electrodeposited layers, the stability of the system permeability was found deeply depending on the chain length.
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Effects of Activating Flux on Inconel 718 Alloy and AISI 304 Stainless Steel Dissimilar TIG Welds

Authors: Hsuan Liang Lin, Zhau Hong Hsu, Wun Kai Wang

Abstract: The purpose of this work is to investigate the effects of activating flux on the penetration, depth-to-width ratio (DWR), angular distortion and hardness of Inconel 718 alloy and AISI 304 stainless steel (SS) dissimilar welds in the tungsten inert gas (TIG) welding process. In the activated TIG (A-TIG) process, the single component fluxes such as SiO_2, NiO, MoO_3 and MoS_2 and the mixed component fluxes that using 50 % of each single component flux to create six new mixtures were used in the experiment. The experimental results showed that the A-TIG welds coated with 100% SiO_2 flux was provided with best DWR of dissimilar welds. In addition, the experimental procedure of A-TIG welding process not only produced a significant increase in penetration and DWR of weld bead, but also improved the angular distortion and hardness of Inconel 718 alloy and AISI 304 SS dissimilar welds.
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Preparation and Characterization of Rice Husk Powder Incorporated Natural Rubber Latex Foam

Authors: Shamala Ramasamy, Hanafi Ismail, Yamuna Munusamy

Abstract: Rice husk powder (RHP) is an abundant agricultural by product that is produced in bulk quantity as part of rice milling. This research is carried out to

incorporate RHP with natural rubber latex (NRL) compound. Different loading of RHP is added to NRL compound and is foamed to make natural rubber latex foam (NRLF) using a well known technique called the Dunlop method. The tensile properties of modified NRLF is studied and compared with the controlled NRLF which has zero RHP loading. The morphology and micro structural characterization has been performed by Tabletop microscopy (TM1000). The tensile strength decreases at 2.5 pphr but increases again as the filler loading increases. Elongation at break decreases whereas modulus at 100% elongation (M 100) and hardness increases as the filler loading increases.
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Aqueous Dispersion of Rice Husk Powder as a Compatible Filler for Natural Rubber Latex Foam

Authors: Shamala Ramasamy, Hanafi Ismail, Yamuna Munusamy

Abstract: Rice husk powder (RHP) which is a fibrous agricultural waste is widely used as potential filler, novel adsorbent or coating for dry polymers. However, the compatibility of RHP with natural rubber latex (NRL) is yet to be studied. The main goal of this reported work was to create a method to incorporate RHP with NRL and achieve a compatible dispersion. However the amorphous silica content (acidic nature) in RHP makes it difficult to directly incorporate RHP to NRL compound. In this research, RHP was modified by adding ammonia, distilled water and dispersing agents to make an aqueous compatible alkaline dispersion for NRL. Also the particle size of RHP is reduced up to - 300micron to make it more compatible with the NRL. The compatibility of modified RHP is analyzed by sedimentation with time, particle size analyzer, pH and morphology study. The test results supports that modified RHP is more compatible with the NRL compound to obtain a stable foam in NRLF preparation.
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Effect of Ball Milling Parameters on the Synthesization of Carbon Nanotube Aluminium Nano Composite

Authors: Abdullah Umma, Md Abdul Maleque, Idris Yaacob Iskandar, Yeakub Ali Mohammad

Abstract: Recently, carbon nanotubes (CNTs) are attracting much interest as fibrous materials for reinforcing aluminium matrix composites due to unique properties such as high strength, elastic modulus, flexibility and high aspect ratios. However, the quality of the dispersion is the major concern factor which determines the homogeneity of the enhanced mechanical and tribological properties of the composite. This work study and characterized the nanocomposite prepared with different weight percentage of CNT in aluminium matrix using powder metallurgy route under high energy planetary ball milling operations. The ball milling was performed for three hours at different milling speeds and under controlled atmosphere. The experimental results showed homogeneous dispersion of CNTs in aluminium matrix at 300 rpm. The preliminary mixing of CNTs and aluminium powder in a tube via manual shaking could be the main contributing factor in

achieving uniform dispersion of CNT in aluminium matrix after ball milling. The addition of ethanol as a process control agent reduced the agglomeration of CNTs in the matrix. Control atmosphere during milling also prevented the formation of inter metallic compounds such as aluminium carbide in the composite.
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Tensile Properties Evaluation of Paper Pulp Packaging at Different Sections and Orientations on the Egg Tray

Authors: A. Masni-Azian, Imtiaz Ahmed Choudhury, Haeryip Sihombing, M.Yaakob Yuhazri

Abstract: Paper-based material has been frequently used as part of packaging solution as an option towards reducing municipal solid waste generation. Various studies on mechanical behaviour of paper-pulp packaging material have been conducted based on the machining direction and cross machining direction. However, there is still gap of information on paper-pulp packaging material behaviour at diagonal direction. A study has been conducted to investigate the variability to tensile properties of paper-pulp packaging at various packaging section (draft and base surface) and different specimen orientation (horizontal, vertical, and diagonal direction). In this research, results from the stress-strain relationship obtained from tensile and compression tests are presented. The data obtained are further analysed using ANOVA to find out whether material variations are significantly different with varying sections and orientations. Findings in this research supported the anisotropic properties of paper-based packaging material. Draft surfaces exhibit weaker strength than base surface. Also, the variability of stiffness and strength of specimens are more significant in horizontal and vertical direction compared to diagonal direction.
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Comparative Study between *Candida antarctica* Lipase B and *Pseudomonas floroscens* as Catalyst for Polycaprolactone Production

Authors: Senthil Kumar Senthil, M.H. Uzir, Z. Ahmad

Abstract: The Effects of temperature on ring-opening bulk polymerizations of ε-caprolactone was studied by using two different lipases Novozym 435 (immobilized form of lipase B from *Candida antarctica*), and Pseudomonas Floroscens as biocatalyst. The polymerization of ε-caprolactone was carried out at 50°C, 60°C, 70°C, 80°C, 90°C, and 100°C. For Novozym 435 the results showed that increasing the reaction time of the polymerization system resulted in an increased rate of monomer consumption and hence increased the molecular weight. For an increase in reaction time the conversion increases steadily and after a gradual increase there is a decrease which is found uniform for all the temperature showing a uniform trend. For a temperature of 70°C and 4 hours molecular weight was found to be 8.4 x 10^4 daltons which were the highest of all the readings that were obtained. In the copolymerizaton of ε-caprolactone (ε-CL) and δ-valerolactone using *Pseudomonas fluorescens* lipase at 60°C for 20 days a copolymer

with molecular weight of 1.97 x 10^5 was obtained. Effects of the reaction time and temperature on the copolymerization have been examined.
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Low Temperature Catalytic Steam Gasification of Waste Palm Trunk by Pottasium Carbonate Supported on Perovskite Oxide

Authors: Nor Azizi, Young Kwang Kim, Jin Miyawaki, Isao Mochida, Seong Ho Yoon

Abstract: A waste palm trunk was used as raw materials of derived biochar in catalytic steam gasification experiments. Pre-treatment was done to enrich the carbon content and removed the heavy and light tar. Waste palm trunk has been added in pyrolysis reactor to produce biochar at temperature 550°C under N_2 flow. The experimental ran in a bubbling fluidized reactor at atmospheric pressure by the steam as gasification agent and Nitrogen as a carrier gas with different catalysts such as K_2CO_3 / $LaMn_{0.8}Cu_{0.2}$, K_2CO_3 / Alumina, Alumina and K_2CO_3 respectively. The experiments have been carried out to investigate the effect of gasification temperature, effect of catalyst and effect of catalyst ratio to biochar on the carbon conversion into syngas. The syngas compositions were analyzed by gas chromatography. K_2CO_3 / $LaMn_{0.8}Cu_{0.2}$ catalyst showed the better carbon conversion as compared to the other catalysts. Perovskite oxide was more effective as a support for the gasification catalyst. The results showed that the better carbon conversion ratio within short time gasification and removed heavy and light tar. K_2CO_3 / $LaMn_{0.8}Cu_{0.2}$ showed high activity for biochar gasification at low temperature and good recovery property near 750°C.
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Experimental Investigation on the Shear Behaviour of Concrete Beams Reinforced with GFRP Reinforcement Bars

Authors: Azlina Abdul Hamid Noor, Ibrahim Azmi, Thamrin Rendy, Abdul Hamid Hanizah

Abstract: This paper presents the experimental results of shear behaviour on concrete beams longitudinally reinforced with glass fiber-reinforced polymer (GFRP) reinforcement bars. Totally sixteen concrete beams were tested under static load. Half of the tested beams were longitudinally reinforced with GFRP reinforcement bars, while, the other half were reinforced with conventional steel reinforcement bars. The beams were prepared with varying test variables, such as shear span-to-effective depth ratios (a/d), amount and types of longitudinal reinforcement bars and stirrup spacing. The experimental results show that the ratios of a/d and stirrup spacing significantly influence the ultimate capacities of the beams. Moreover, more closely spaced diagonal shear cracks were resulted in GFRP reinforced concrete (RC) beams compared to steel RC beams.
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Quality Evaluation of Cold Embossed Hole Based on Profile Measurement Technique

Authors: A.B. Abdullah, S.M. Sapuan, Z. Samad, N.A. Aziz

Abstract: The main objective of this study is to assess the quality of the cold forging hole by focusing the roundness of the hole. In this study, a cold forging process of blind hole of Aluminum Alloy AA6061 experimental rig was developed. In the experiment, two major design parameters i.e. the depth of embossing and diameter of the punch were studied and their influence to the roundness was measured based on the profile obtained from the surface measurement technique. The results will be validated using commercial roundtest machine.
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The Effect of pH on Zinc Phosphate Coating Morphology and its Corrosion Resistance on Mild Steel

Authors: Khalid Abdalla, Rahmat Azmi, Aziz Azizan

Abstract: Zinc phosphate coating is commonly used for corrosion protection of metallic materials, mainly mild steel. In this study, influence of the pH of phosphating bath on the surface morphology and corrosion resistance of zinc phosphate coatings on mild steel was investigated. The phosphate layers were deposited on steel from phosphating bath at different pH values (1.75 ~ 2.75). The surface morphology and composition of phosphate coatings were investigated via scanning electron microscopy (SEM), and energy-dispersive X-ray (EDX). The corrosion resistance of the coating was evaluated by polarization curves (anodic and cathodic) in an aerated 3.5% NaCl solution. The results showed that better surface coverage and corrosion resistance for the steel phosphated at pH 2.75.
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Differences between 2D and 3D Interlaminar Fracture Analysis of Unidirectional Carbon/Epoxy Arcan Specimens: Numerical and Experimental Approaches

Authors: Reza Bakhtiari, Naghdali Choupani, Ehsan Darabi

Abstract: In this paper, the mixed-mode interlaminar fracture behavior of unidirectional carbon-epoxy composite was investigated based on experimental and numerical analysis. A modified version of Arcan specimen was employed to conduct a mixed-mode fracture test using a special loading device. A full range of mixed-mode loading conditions including pure mode-I and pure mode-II loading were created and tested. This test method is a simple procedure, clamping/unclamping the specimens is easy to achieve and only one type of specimen is required to generate all loading conditions. Also, the correction factors were determined via two-and three-dimensional analysis and the results were compared. Results indicated that the interlaminar cracked specimen is tougher in shear loading condition and weaker in tensile loading condition.
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Fabrication and Photoresponse of Self-Organized TiO_2 Mesoporous by Alternative Voltage Condition

Authors: Pacharee Krongkitsiri, Udom Tipparach

Abstract: Mesoporous of TiO_2 electrodes (MOTE) were fabricated on pure titanium sheets in aqueous based electrolytes that consist of $NaSO_4$ NH_4F and Oxalic acid by an anodization method with alternative voltage condition. Morphology of MOTE was characterized by scanning electron microscopy. The characteristic photoresponse in 0.1 M Na_2SO_4 on the MOTE was investigated. The MOTE shows an excellent photoresponse property that is significant at low open-circuit potential.
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Development of Lubricants Evaluation for Different Friction Laws by Using Rigid-Plastic Finite Element Method

Authors: Heng Keong Kam, Wen Chiet Cheong, Chan Chin Wang, Ying Pio Lim

Abstract: A simulator based on rigid-plastic finite element method is developed with two common friction law: Coulomb friction law and constant shear friction law are imposed. This project is to develop a simple method to identify tribological properties of various lubricants by metal forming method. In this project, the influence of different lubricants was studied by using ring compression test. The deformation of the ring compression test was measured to obtain an experimental friction calibration curves under different lubricants. To model the friction effect, theoretical friction calibration curves for Coulomb friction law and shear friction law are generated under various parameter of μ, coefficient of friction (Coulomb friction law) and m, shear factor (constant shear friction law). The experimental and theoretical friction calibration curves were compared and the result shows corresponding. The friction of the lubricants was further verified by using a common method: pulling a block on flat surface with load sensor yields the friction force, F in the basic equation F=μN where N is the normal force. The results match the calibration curves too.
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Energy Absorption Characteristics of Interface Modified GFRP Laminates under Low Velocity Impact

Authors: Ali Mubarak, C. Joshi Sunil

Abstract: The effect of modification of the ply-interfaces in glass fibre reinforced polymer (GFRP) laminates with dispersed micro-particles on its impact characteristics was investigated. The reference and modified laminates were fabricated using woven GFRP prepregs. Impact tests were conducted using an instrumented drop tower device at various incident energy levels. The results were analysed using 5 different energy terms, namely maximum energy (E_{max}), elastic energy (E_{el}), absorbed energy (E_{ab}), energy before peal load (E_{bpl}), energy after peak load (E_{apl}) and the damping index (DI). This investigation elaborates the relationship between the different energy terms as a function of the incident impact energy and time. The analysis of the energy characteristics indicates reduction in impact damage in the modified laminates. The

modified laminates show higher E_{bpl} and lower DI when compared to the reference laminates.
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Effects of Various Additives on Drying Shrinkage, Compressive and Flexural Strength of Lightweight Foamed Concrete (LFC)

Authors: Ahmad Farhan Roslan, Hanizam Awang, Md Azree Othuman Mydin

Abstract: This paper presents an investigation on lightweight foamed concrete (LFC) with different type of additives. LFC with 600, 1000 and 1400 kg/m^3 density were cast and tested. Fly ash, lime and polypropylene fibre were used on each density with different percentages. All the additives effects were compared with normal LFC as control mix. Mechanical properties of LFC were evaluated with several tests up to 180 days. The results show that the drying shrinkage, compressive strength and flexural strength are affected by the hydration process of each additive in the harden LFC. Fly ash as pozzolanic material helps to strengthen the LFC, though it needs longer curing period to achieve ultimate strength. Lime gives slight contribution to strength as detail investigation on microstructure formation will give clear answer on how the mechanical properties were affected. The addition of polypropylene contributes to flexural strength and shrinkage of LFC. Polypropylene fibre only contributes to compressive strength at low LFC density.
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Effects of Cavity Length on Optical Characteristics of Deep Violet InGaN DQW Lasers

Authors: Ghasem Alahyarizadeh, Hassan Zainuriah, Sabah M. Thahab, Maryam Amirhoseiny, Alaa J. Ghazai

Abstract: The performance characteristics and their dependence to cavity length of deep violet InGaN DQW lasers emitting at 390 nm have been investigated using the Integrated System Engineering Technical Computer Aided Design (ISE TCAD) software. The focus of simulation was on the study of optical properties which were carried out with varying cavity length from 200μm to 600μm. The simulation results indicated that the cavity length strongly affects the optical properties of the violet InGaN DQW laser. They showed that the parameters related to the output power such as optical intensity increases by increasing cavity length due to increase of applied current to the laser system. The results also indicated that the parameters such as optical material gain, stimulated and radiative recombination which are related to quantum efficiencies and laser performance decrease by increasing cavity length. It was shown that the laser structure with the longer cavity length has the lower optical loss.
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Effect of Electrolyte Concentration on the Growth of Porous Anodic Aluminium Oxide (AAO) on Al-Mn Alloys

Authors: C.H. Voon, Mohd Nazree B. Derman

Abstract: In this study, the effect concentration of electrolyte on pore nucleation process during anodizing was investigated. It was found that the concentration of oxalic acid influenced the morphologies and regularities of porous AAO formed on aluminum-manganese substrate. When the concentration of oxalic acid is 0.1 M, the porous AAO exhibited a disordered pores arrangement and no long range order was observed. However, when the concentration was increased to 0.3 M and 0.5 M, hexagonal pores arrangement and long range order were obtained. Although the hexagonal pore arrangement was still retained, further increasing the concentration of oxalic acid to 0.7 M render the long range order disappeared. The rate of increase of oxide mass of porous AAO increased with the concentration of oxalic acid.
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A Study on the Rheological Properties of Low-Density Polyethylene/Palm Kernel Shell Composites

Authors: B.Y. Lim, Salmah Husseinsyah, Teh Pei Leng

Abstract: The rheological properties of the low density polyethylene (LDPE)/palm kernel shell (PKS) composites were studied by using a melt flow indexer. The silane treated and untreated composites were investigated. Both of the composites were further varied by amount of filler loading from 10 to 40 php. The testing temperature of composites varied from 180 to 210 °. It was found out that the MFI values of the composites increased with temperature but decreased with a rise of filler loading. The treated LDPE/PKS composites exhibited lower MFI values compared to untreated composites, which indicated the increase of viscosity. Thus, a better adhesion between the LDPE matrix and PKS was established. The effect of temperature on the viscosity of LDPE/PKS composites was found to obey the Arrhenius equation. The results showed that the activation energy of the composites increased with the increase of filler loading. However, at similar filler loading, the silane treated composites showed lower activation energy compared to untreated composites, leading to the reduction of their temperature sensitivity.
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Effect of Post-Heated Concrete Cylinders Repaired with CFRP Reinforcement

Authors: Sharifah Salwa Mohd Zuki, J. Jayaprakash, Lee Kit Hock, Ong Chong Yong

Abstract: This paper presents the experimental results of post-heated concrete cylinders repaired externally using Carbon Fibre Reinforced Polymer (CFRP) fabrics. Eighteen concrete cylinders of size 155mm x 300mm were exposed to different temperatures of 100, 200, and 300°C for 3 hours. Subsequently, the exposed concrete cylinders were naturally cooled down to room temperature and repaired externally using CFRP reinforcement. All these cylinders were tested to failure under axial loading. Results show that the residual strength of post-heated CFRP repaired concrete cylinders was significantly increased between 47 to 51% over the control cylinders. However, the

ductility of CFRP repaired concrete cylinders was increased at the elevated temperatures.
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Study on Performance and Characteristic of Microorganisms in a Waste-to-Energy System

Authors: Amirhossein Malakahmad, Noor Ezlin Ahmad Basri, Sharom Md Zain

Abstract: Performance and characterization of microorganisms in a laboratory-scale anaerobic baffled reactor (ABR) was studied. The ABR was fed continuously at organic loading rate (OLR) of 15.2 g COD/l.d with a substrate containing pre-tested combination of kitchen waste and activated sludge. The HRT (hydraulic retention time), C/N (carbon/nitrogen) and F/M (food/microorganisms) ratios were maintained at 3 d, 31.4 and 0.35 gCOD/gVSS.d, respectively. The amounts of fat, protein, cellulose, hemi-cellulose and lignin which are significant polymers for anaerobic digestion start-up were found to be in appropriate ranges. Results show reduction of pH in front compartments and its boost in successive compartments. This indicates proper placement of acidogens and methanogens in the ABR. Also, significant growth in height of ABR granule bed was observed in the system based on formation and retention of granules. Microorganism characterization reveals large population of *Methanosarcina* in front part of the reactor although toward the end the amount for *Methanosaeta* increased. While *Methanobacterium*, *Methanosprilium*, *Methanococcus* and *Methanobrevibacter* w ere observed in the ABR, higher percentage
of *Methanosarcina* and *Methanotrix* indicates production of methane from acetate conversion.
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In Vitro Biodegradability of Poly(lactic Acid)/Hydroxyapatite Biocomposites Prepared by Solvent-Blending Technique

Authors: Mujtahid Kaavessina, Fitriani Khanifatun, Imtiaz Ali, Saeed M. Alzahrani

Abstract: Poly (lactic acid) was solvent-blended and formed as thin ribbons with different weight fraction of hydroxyapatite, namely 5, 10 and 20wt%. In-vitro biodegradability of biocomposites was performed in phosphate buffer solution (PBS) at 37°C. The presence of hydroxyapatite tended to increase biodegradability of poly (lactic acid) in its biocomposites. Thermal stability of biocomposites was always higher than that neat poly (lactic acid) either before and after hydrolytic degradation tests. After biodegradation tests, some micro-holes and cracks were appeared in the surface morphology of biocomposites as well as the increasing crystallinity occurred.
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Improving Surface Durability of High Volume Fly Ash Concrete with Application of Alkali Solution

Authors: Antoni, Oswyn K. Wattimena, Djwantoro Hardjito

Abstract: This study aims to determine whether the surface durability of high volume fly ash (HVFA) concrete can be improved by applying alkali solution on its hardened surface. Concentrations of alkali solution and methods of application were studied on several w/cm ratios and replacement percentage of fly ash in concrete mixture proportion to investigate the durability performance. Durability tests conducted were accelerated sulfuric acid attack and ion chloride penetration to investigate the improved durability of HVFA concrete. From the results, it was shown that applying alkali solution on the surface of HVFA concrete can increase its durability performance. The different w/cm ratio and the percentage of fly ash used affect the increase in durability performance. The optimum alkali solution concentration and method of application need further research to determine their effectivity.
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Effect of Silane Coupling Agent on the Curing, Tensile, Thermal, and Swelling Properties of EPDM/Mica Composites

Authors: Hanafi Ismail, Z.A.A. Hamid, S. Ishak

Abstract: In this work, the influence of silane (bis (3-triethoxysilylpropyl) tetrasulfide) or Si69 coupling agent on properties of EPDM/mica composites was studied. Both EPDM/mica composites with silane and without silane were compounded using two roll mill at various filler loading (i.e., 100/0, 100/10, 100/30, 100/50, 100/70). The tensile and thermal properties as well as fracture surfaces of composites were tested using Instron Universal Testing Machine, Thermal Gravimetric Analysis (TGA) and Emission Scanning Electron Microscope (SEM). The results indicated that the optimum cure (t_{90}), scorch time (t_{s2}) value was lower, while maximum torque (M_H) value slightly higher for EPDM/mica composites with silane compared to EPDM/mica composites without silane. The tensile properties, M100 and M300 value increased for EPDM/mica composites in the presence of silane and the optimum filler loading for those properties occurred at 50 phr. In addition, thermal stability and swelling ratio for both composites improved with increasing filler loading. However, EPDM/mica composites with silane show better thermal stability and swelling ratio due to stronger linkage taking place at the rubberfiller boundary and it promotes filler dis-agglomeration.
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Comparison between the Nominal Loss in 3%SiFe and Amorphous Transformer Core Materials

Authors: Dina Maizana, Shuhaimi Zakaria Abdullah

Abstract: An investigation of nominal loss in 3%SiFe and amorphous of the transformer core materials will evaluate in this paper. The investigation involves the variation of power loss, flux leakage, and total harmonic distortion. The nominal loss has been measured using Epstein test frame with three layers of lamination. The loss in the amorphous transformer core material is 57.46% better than the transformer core with 3% SiFe material at flux density of 1.2T, 50 Hz. The flux leakage at corner in the 3% SiFe transformer core material is the lowest than the two of transformer core material,

over the whole flux density range. Total harmonic distortion flux is the largest in the amorphous of transformer core materials and the smallest in the 3% SiFe of transformer core material. Using the amorphous material in transformer core is more efficient than the two of transformer core materials.
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Effects of Silane Coupling Agent on Mechanical Properties and Swelling Behaviour of Coconut Fiber Filled Polypropylene Composite

Authors: M. Sabri, F. Hafiz, K. Shahril, A. Siti Rohana, Salmah Husseinsyah

Abstract: Silane treatment used to improve mechanical properties and swelling behaviour of polypropylene/coconut fiber (PP/CF) composites by creating more adherent bonding between CF filler and PP Matrix. 3-Aminopropyltriethoxysilane (3-APE) treated and untreated composites were prepared in formulation of 10 wt%, 20 wt%, 30 wt%, and 40 wt%. The mechanical testing indicates that composite with 10 wt% has the optimum value of tensile strength, and the 3-APE treated composites shows the tensile strength was increased. By increasing of filler loading, elastic modulus was increased while the elongation at brake was decreased. Meanwhile, the swelling test discerned that the increase of filler loading increased the water absorption of composites and the presence of 3-APE reduced the equilibrium water absorption percentage.
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Study of Cold Rotary Forming by Using Rigid-Plastic Finite Element Method

Authors: Wen Chiet Cheong, Heng Keong Kam, Chan Chin Wang, Ying Pio Lim

Abstract: In this project, a rigid plastic Finite Element Method (FEM) simulator was developed for simulating the plastic flow material in rotary forming. The simulation result was able to predict the cup height of the final product up to an accuracy of 80% and the localized deformation which leads to failure in the deformation process. The workability of the aluminum disc was also studied to understand the material flow behavior under incremental bending and flow forming by utilizing a lathe machine.
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Cytostatic Activity of Clinoptilolite against Human Cervical Cancer Cell Lines Using Three Different Media-Sterilization Techniques

Authors: Noor Azhana Ghazi, Nik Ahmad Nizam Nik Malek, Hamdan Salehhuddin

Abstract: Clinoptilolite has been proven useful in cancer therapy in the last decade. The use of natural zeolite such as clinoptilolite requires some purification of the raw material before it can be applied in biomedical applications, yet microorganism contamination is still viewed as a possible issue for most researchers. Therefore, the clinoptilolite-treated media must undergo filter sterilization process prior to its use in any *in vitro* research of human cell studies. The aim of this study was to determine whether clinoptilolite cytostatic effect on cervical cancer (HeLa) cells will differ when a different media-

sterilization technique is used on the clinoptilolite-treated medium. Comparison of the effect of clinoptilolite-treated medium on cell cytostatic activity was made between three sterilization methods; heat sterilization using an autoclave, UV radiation and filter sterilization. Results showed that there were inhibition of HeLa cell growth after clinoptilolite treatment in all three media-sterilization techniques. Significant differences were shown in all except between sterilizing using UV radiation and filter sterilization. This proved that *in vitro* cytostatic activity of clinoptilolite on human cervical cancer cells may be affected if different sterilization methods are used to sterilize the pre-treated media. Nonetheless, filter sterilization is still the preferred choice for sterilizing treated-media in cell culture. Keywords: Zeolite, clinoptilolite, cytotoxicity, cancer cell lines, sterilization.
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Morphological and Structural Study of Nanostructured Tin Dioxide (SnO_2) Thin Films by Spray Pyrolysis

Authors: Boon Hoong Ong, Heng Choy Lee, Sharifah Bee Abdul Hamid

Abstract: Nanostructured SnO_2 thin films were deposited on glass substrate using chemical spray pyrolysis technique. Three influent synthesis parameters, namely (i) the precursor concentration (0.2M and 0.5M), (ii) the substrate temperature (250°C and 350°C) and (iii) doping with zinc (Zn) were investigated in term of their effects on the morphology and structure of SnO_2 thin films. These films were characterized by X-ray diffraction (XRD), field emission scanning electron microscopy (FESEM) and energy dispersive X-ray spectrometry (EDX) techniques. The grain size of the films was observed to increase as the concentration of the precursors is increased. Substrate temperature is proved to be crucial in determining the crystallinity of the films as the films are reported to grow at temperature above 270°C. Besides, the addition of dopant was found to reduce the grain size of the film.
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Moisture Absorption and Shock Cushioning Behavior of Flexible Polyurethane Foam Filled with Saw Dust

Authors: Syahidah M. Rum, Mohd Azlan, N.V. David

Abstract: This paper presents the moisture absorption and shock cushioning properties of flexible polyurethane foams (PU) filled with saw dust fibers at 10, 15 and 20wt%. The compositeswere fabricated using open molded method from a two-part liquid foamsystem consisting of part-A (Isocyanate) and part-B (Polyol).The diffusion rates from the moisture absorption test is calculated using Ficks second law equation. Thesample with 10 wt% filler shows the highest diffusion ratewhile the lowest rateis sample with15wt% filler. The shock cushioning properties was determined via drop test where an 11.48-kg weight is dropped, from a height of 610 cm on the composites. The average *G*value that represents product fragility was found to be 55.45.
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Effect of EDA/PEGDGE Mole Ratios on PEG-Based Hydrogel Scaffolds Properties

Authors: Zuratul Ain Abdul Hamid, Anton Blencowe, Greg Qiao, Geoff Stevens

Abstract: The synthesis of biocompatible hydrogel based on poly (ethylene glycol) (PEG) and ethylene diamine (EDA) using epoxy-amine chemistry was conducted. PEG was chosen as the base material (or monomer) to synthesise hydrogels in this study due to its high hydrophilicity, biocompatibility and low toxicity properties. The effects of mole ratios of EDA to PEGDGE on the hydrogel scaffolds properties (i.e., gelling time, swelling) were investigated. It was found out for hydrogel scaffolds prepared at 1.2 and 1.4 M [PEGDG and an EDA/PEGDGE mol ratio of 0.5 in DMSO gave the optimum hydrogel properties. Swelling studies has confirmed that hydrogel prepared at 0.5 mole ratios consist of highly cross-linked network as expected.

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Thermophysical Properties of Ionic Liquid with Thiocyanate Anion: Effect of Cations

Authors: G. Gonfa, M.A. Bustam, T. Murugesan, Z. Man, M.I. Abdul Mutalib

Abstract: In the present work, four ionic liquids containing thiocyanate anions with different cations were synthesized, and some of their thermophysical properties were measured. The density of the ionic liquids were measured in the temperature range of T = (293.15 to 353.15) K. The thermal expansion coefficient values were obtained from the experimental density values. The molar volume, lattice energy, and standard entropy of the ionic liquids were calculated from the experimental results. A thermogravimetric analyzer (TGA) was used to investigate the thermal degradation behavior of synthesized ionic liquids. The effects of temperature and nature of cations on the thermophysical properties were presented.

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Printing Qualities on Inkjet-Printed Paper from Varnish Coating Agent with Rice Husk Silica Particles

Authors: Nitus Tipsotnaiyana, Lerpong Jarupan, Chiravoot Pechyen

Abstract: To enhance printing qualities, this study used refluxed silica (SiO_2) from rice husk by hydrochloric acid (HCl) at different molarities and reaction times as coating agent for printed paper. Characterization of the refluxed silica from 2M HCl 120 min elucidated the purity of 98.7% and amorphous structure. Particle size of the silica exhibited uniform size of 3 μm and the color measurement (CIE L*a*b*) indicated 94.79+0.48+1.24, whiteness and color difference (E) were 84.85, 3.28, respectively. The coating agent was prepared by water-based varnish of acrylic resin mixed with the synthesized silica at different proportions: 0.0, 0.5, 1.0, and 1.5 (%wt), and later was applied on 170 g/m^2-white kraft papers. The results showed that the water-based coating varnish with silica exhibited an increase of viscosity as increasing the amount of the silica. Printing qualities indicated that the vanished printed paper with 1.0% silica elucidated the highest details in shadow tone and text (font) sharpness. The color

gamut yielded a wider scope than the printed papers which were varnished with the silica at 0.0%, 0.5% and 1.5%. Nonetheless, the color density showed insignificant difference to 1.5% silica varnished paper.
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surface area as high as 1066.70 m^2/g, Methylene blue adsorption and Iodine number of 288.90 and 590.50 mg/g, respectively. The surface area and adsorption properties of carbon produced using sulfuric acid activation were higher than that produced using hydrochloric acid activation. The results suggest the feasibility of the process from the point of view of both porous texture and adsorption yield.
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Mechanical Properties and Morphologies of PP/Co-PP/Talc Composites for Microwave Application

Authors: J. Piwsawang, T. Jinkarn, Chiravoot Pechyen

Abstract: Unmodified talc fillers were compounded with polypropylene (PP) and copolymer polyethylene (Co-PP) separately in a Brabender plasticorder internal mixer at 180 °C and 50 rpm in order to obtain composites, which contain 040 phr (per 100 part of resin) of filler at 40 phr intervals. The morphology development and the mechanical properties of the composites with reference to filler loading were investigated. In terms of mechanical properties, Youngs modulus and maximum compression load increased, whereas yield strength and elongation at break decreased with the increase in filler loading of PP/Co-PP/Talc composites. The PP/Co-PP exhibited lower yield strength and youngs modulus, and higher elongation at break than talc composites (data not show here). Scanning electron microscopy (SEM) was used to examine the structure of the fracture surface to justify the variation of the measured mechanical properties.
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Structures and Properties of Isotactic-Polypropylene/Synthesized Micro Cellulose Tray: Effects of Micro Cellulose Loading

Authors: Pongpat Sukhavattanakul, Lerpong Jarupan, Chiravoot Pechyen

Abstract: Cellulose was derived from cotton fabric waste. Composites of microcellulose fibers (MC) and isotactic polypropylene (i-PP) was prepared by melting and mixing, and maleic anhydride grafted polypropylene (MA-g-PP) was used as compatibilizer. The MC was blended in different ratios up to 20 phr with i-PP using corotating twin-screw compounder and then a forming of trays was done by injection molding. Effects of MC on mechanical properties of i-PP were investigated. Changes in mechanical and morphological properties with different MC loading were discussed. The composite of i-PP/MA-g-PP/MC rendered better results in comparison with the i-PP/MC composite. The compressive strength and modulus of i-PP/MC composites increased with the addition of 20 phr MC. The i-PP/MA-g-PP/MC-20phr composites showed higher compressive strength and modulus than the i-PP/MC-20 phr without MA-g-PP due to increased interfacial interaction between MC and i-PP matrix. Thermal properties of i-PP/MC composites with and without MA-g-PP were not significantly different from pure i-PP. In conclusion, MC derived from cotton fabric waste could be used as a reinforcing agent for manufacturing thermoplastic.
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Optimization of Annealing Temperature for PVDF-TrFE (70:30 mol %) Thin Film

Authors: Mohamad Hafiz Mohd Wahid, Rozana Mohd Dahan, Siti Zaleha Sa'ad, Adillah Nurashikin Arshad, Muhamad Naiman Sarip, Mohamad Rusop Mahmood, Wan Haliza Abd Majid

Abstract: The annealing temperature of 250nm PVDF-TrFE (70:30 mol%) spin coated thin films were optimized. The annealing temperature were varies starting from solvent evaporation (T_s), Curies transition (T_c), up to melting temperature (T_m). The result shows that the dielectric constant increases with the increasing of annealing temperature. Supported with the XRD observation indicating there were an improvement in crystallinity consistently with the increasing of the annealing temperature. Morphological properties of the annealed PVDF-TrFE thin films were observed by utilizing Field Emission Scanning Electron Microscope (FESEM) at 100k magnification. It can be found that, the annealing temperature promotes the development of elongated crystallite structure which known as ferroelectric crystal. However, the presence of nanoscale cracks on the thin film annealed at 160°C (AN160, over T_m) suggesting high possibility to posed defects while in device applications.

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The Structural Studies of Oxirane Ring Opening Reaction in Epoxidized Natural Rubber (ENR-50) by $SnCl_2.2H_2O$ and the Formation of ENR/TiN Complex Hybrid

Authors: Hamzah Rosniza, Abu Bakar Mohamad

Abstract: Oxirane ring opening reaction of epoxidized natural rubber (ENR-50) is a promising method to produce hybrids or introduce reactive fillers into the polymers through the covalent bond. This paper reports the reaction between ENR-50 and $SnCl_2.2H_2O$ under CO_2 environment. The complex formation is characterized via FTIR, ^{1}H, ^{13}C and ^{119}Sn NMR. ^{1}H NMR which displays deduction of methine proton integrals at δ 2.71 ppm implies the occurrence ring opening reaction. While ^{13}C NMR reveals new peaks which corresponds to Sn-C bond. The ^{119}Sn NMR proves four-coordinates tin in ENR/Sn complex hybrid.

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Characteristics of Fe-Yttria Composites Fabricated by Powder Metallurgy Method

Authors: M. Marina, K. Alir, W. Rahman, Z. Nooraizedfiza, Mohd Asri Selamat, M.Z.M. Zamzuri

Abstract: This study is focused on fabricating and characterizing iron (Fe) composites prepared by powder metallurgy route reinforced with varying weight of Yttria (Y_2O_3). Composites were prepared based on 5 wt. % to 15 wt. % of reinforcement powder with particle size ranging from 1-10µm. Pure Fe matrix composites were also prepared for comparison purpose. This paper will report the microstructure, bulk density and micro hardness values of the composites. Powder characterization and microstructures of the

composites were examined using Scanning Electron Microscope (SEM) which indicated homogenous distribution of reinforcement particles in the metal matrix. Bulk density of the composites was calculated using standard Archimedean method showing decreasing values as the weight percentage of Y_2O_3 increases. Micro-hardness was measured using micro-Vickers hardness instrument. The data obtained shows that the Fe-Y_2O_3 composites samples possessed superior hardness value with the increasing quantity of reinforcement compared to the unreinforced Fe composite.
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Varistor-Like Effect in Zinc Oxide Bionanocomposite

Authors: M. Aizuddin Abdul Rahman, Shahrom Mahmud, Rabab Khalid Sendi, Abdul Karim Alias

Abstract: Bionanocomposites (BNCs) were prepared using sago starch (SS) based polymer embedded with nanorods zinc oxide (ZnO-N) as nanofiller. The percentage of ZnO-N was varied from 2 weight percent (wt %) to 10 wt % of total solid. Transmission electron microscope (TEM) and scanning electron microscope (SEM) were used to analyze the morphology and dispersion of ZnO-N in BNCs. Raman spectroscopy analysis showed the present of ZnO-N in BNCs not forming new chemical bonding instead a physical interaction occur between the nanofillers and BNCs. Current-field density behavior of BNCs in low voltage region showed nonlinear current-voltage behavior and the value of resistance increases as the applied voltage increases. Breakdown voltage has been achieved at field density in the range of 500 to 900V depends on the concentration of nanofiller.
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Efflorescence Phenomenon on Concrete Structures

Authors: Norsuzailina Mohamed Sutan, Hamdan Sinin

Abstract: Since the introduction of modern pigmented concrete products in the early 1950s, coloured concrete products have opened new possibilities in the field of building and landscape design and ironically to a new visible phenomenon called efflorescence. Unfortunately, despite careful selection of raw materials and conscientious compliance with the production parameters, colour changes of the finished products are always the enemy. In many cases, these colour irregularities often described as fading is attributed to calcium carbonate efflorescence. One might question how efflorescence can still occurs after presumably, manufacturers have done everything right such as utilized quality materials, had a good mix design, exceeded strength requirements and met production schedule. By studying in depth the mechanism of efflorescence one might answer this mind-boggling question. Although, a great deal of work has been done in investigating the phenomenon of efflorescence and agreement has been reached to a large extent by researchers worldwide on the mechanism behind the formation of efflorescence, there is still no effective methods that can be used by concrete manufacturers to prevent the formation of efflorescence on finished concrete products.

This paper has the purpose of providing some direction for future work to mitigate this phenomenon.
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Effects of Zinc Chloride Impregnation on the Characteristics of Activated Carbon Produced from Physic Nut Seed Hull

Authors: Ibrahim Yakub, Masita Mohammad, Zahira Yaakob

Abstract: Activated carbon was developed from physic nut seed hull through chemical activation using zinc chloride. The characteristics of raw physic nut seed hull as well as char and activated carbon from physic nut seed hull were obtained to study the effects of $ZnCl_2$ impregnation. The comparisons of the characteristics that included elemental composition, surface morphology, surface area, surface functional groups and zeta potential were made on the three samples. The study found that $ZnCl_2$ had positive effects towards developing activated carbon including increasing the carbon content, surface area and pore volume besides improving the microporosity and surface charge distribution of the carbon.
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Study on Renewable Resource-Based Composites from Agro Waste *Alpinia galanga* Natural Fibers

Authors: Rohani Mustapha, Mohd Syahrizul Chik, Mohamad Awang

Abstract: Recently there has been a surge of interest in using natural fibers from renewable resources as alternative to replace traditional synthetic fibers. This is due to the increased environmental and sustainability awareness. In this study, high density polyethylene (HDPE) was compounded with untreated and treated agro-waste natural fibers *Alpinia galanga*. Alkali treatment using sodium hydroxide was used to improve the interface adhesion between fibers and polyethylene matrix. Polyethylene-*Alpinia galanga* composites were prepared using an injection molding machine at various fiber contents of 3, 6, 10 and 15 wt% and characterized. Experimental studies have shown that in general fibers function as filler in polyethylene composites and exhibited tensile strength relatively close to the strength of the unfilled composites. The increasing of *Alpinia galanga* content decreased elongation at break and increased the Youngs modulus of Polyethylene-*Alpinia galanga* composites. It was also observed that treated fiber composites showed higher thermal stability than that of untreated fiber composites.
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Contribution of Polypropylene Fibre in Improving Strength of Foamed Concrete

Authors: Josef Hadipramana, Abdul Aziz Abdul Samad, Ahmad Mujahid Ahmad Zaidi, Noridah Mohammad, Noorwirdawati Ali

Abstract: Foamed concrete as favorable substitution conventional concrete can be used in wide range of constructions. Usage the Polypropylene Fibre (denoted as PF) in this investigation examined contribution of PF on strength of foamed concrete. Mechanical

test were performed to measure effect of PF on improving compressive and splitting tensile strength. Results indicate that PF significantly improving compressive and splitting tensile strength. Behavior of PF where drawn into foamed concrete similarly with normal concrete. The fibrillation and interfacial bonding between PF and matrix has been occurred and reduced the micro crack of matrix and prevented propagation crack growth. However influence of porous of foamed concrete is considered. Process of curing continuation 60 and 90 days indicate that interfacial adhesion is wider when cement hydration process is running. Scanning Electron Microscope (SEM) exhibits condition microstructure of foamed concrete added by PF alter the microstructure, especially interfacial bonding between PF and matrix.
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Effect of Uncontrolled Burning Rice Husk Ash in Foamed Concrete

Authors: Josef Hadipramana, Abdul Aziz Abdul Samad, Ahmad Zaidi Ahmad Mujahid, Noridah Mohammad, Fetra Venny Riza

Abstract: Recently, foamed concrete has become a popular construction material that can be used in wide range of constructions application. Whilst the Rice Husk Ash (RHA) as agro-waste is contain high amount of silicon dioxide. RHA is produced in significant amount every year from agriculture countries. RHA has potential as a material to produce foamed concrete. In this research RHA has been used as a replacement for fine aggregate which used in construction as ordinary concrete material. In this study, foamed concrete with target density 1400, 1600 and 1800 kg/m^3 has been produced. The compressive strength of foamed concrete with RHA has been tested. Concrete with Ratio 1:3 of RHA/Sand has higher compressive strength than ratios 3:1 and 2:2 of RHA/sand for every density. XRD and XRF test has been used to determinate chemical composition and crystalline structure of RHA. The result showed that RHA is an amorphous material which amorphous is important thing to pozzolanic process when hydration of cement paste. SEM and EDS test has been conducted to determine microstructure and chemical composition on microstructure of RHA foamed concrete. Amorphous RHA incorporating cement paste produces pozzolanic reaction. It is reduces the porosity and width of interfacial zone in such a way the density is increase.
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The Evaluation of High Calcium Green Polymeric Concrete

Authors: Ahmad Ruslan Mohd Ridzuan, A.A. Khairulniza, M.A. Fadhil

Abstract: ncreasing environmental concerns of the cement industry brings about the requirement to the development of new binders. Polymeric concrete containing no cement provides great potential in reducing the global warming problems caused by CO_2 emissions in Portland cement production. On the other hand, large amount of waste paper sludge ash produced annually in Malaysia has caused a disposal problem as they require a proper dumping process whereby it is very costly. The study focuses on the utilization of this high calcium Waste paper sludge ash (WPSA) in polymeric concrete containing recycled concrete aggregate (RCA). WPSA is chemically activated

by a high-alkaline solution to form paste that binds aggregate in the mixture. Sodium hydroxide and sodium silicate solution are used as alkali activators of silica (Si) and aluminium (Al) in main binders. The polymeric concrete samples were exposed to external ambient condition and tested for compressive strength and shrinkage at 3, 7, 28, 56, and 90 days to identify the strength and deformation of the polymeric concrete. X-Ray Fluorescence (XRF) analysis performed to ascertain the chemical properties of the produced WPSA. The result of polymeric concrete yielded very minimum shrinkage. The measurement compressive strength is up to 7MPa at 90 days. Hence, this new green material will bring benefits to the environment and is of economical value.
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Lightweight Fly Ash-Based Geopolymer Concrete

Authors: A. Abdulkareem Omar, Mohd Mustafa Al Bakri Abdullah, Kamarudin Hussin, I. Khairul Nizar

Abstract: The experiments of this study were preformed to study the synthesis process for lightweight aggregate geopolymer concrete (LWAGC) using normal sand as a fine aggregate and expanded clay as lightweight aggregate. The LWAGC was synthesized by the alkali activation of a fly ash (FA) as the source material by mixture of liquid alkaline activator. The resultant LWAGC possessed a compressive strength of 18.86 MPa at age of 28 days with oven-dry density of 1438.7 kg/m^3.The microstructure images showed that the high alkalinity chemical reaction of the geopolymerization process does not react with the used aggregate, and the smooth surface of the aggregate declined the interaction between the geopolymer matrix and aggregate. The significant result of the current study was the proven of the reliability of the ACI 211.2-98 standard used for designing and mix proportioning of OPC lightweight aggregate structural concrete in the production of LWAGC.
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Effect of Diluents on Crystallite Size and Electronic Band Gap of ZnO Nanoparticles Synthesized by Mechanochemical Processing

Authors: Mahesh Talari, Mohd Salleh Mohd Deni, Nursyahadah Mohd Zor, Venugopal Thota, Zakaria Azlan

Abstract: This paper presents the characterization results of Zinc Oxide (ZnO) nanoparticles prepared by mechanochemical processing using different moles of diluents. ZnO nanoparticles of different crystallite size were synthesized by milling the precursor powders for 5 hours in a high energy ball mill with Zirconia media. NaCl was added as process control agent (PCA) to control the reaction kinetics, as final particle size of nanoZnO is influenced by the reaction rate. X-ray Diffraction (XRD) data was used to compute and analyze the crystallite size of nanoparticles and also to analyze the progress of reaction during milling process. Field Emission Scanning Electron Microscope was employed to analyze the particle morphology and size distribution of ZnO nanoparticles. Ultraviolet Visible (Uv-Vis) spectroscope was employed to analyze the optical absorption of ZnO nanoparticles. Tauc plots were used to determine the

energy gap of the ZnO nanoparticles. Crystallite size values of ZnO nanoparticles are seen to be influenced by the amount of PCA and heat treatment. ZnO nanoparticles with a range of E_g (3.1 to 3.14 eV) were obtained depending on process parameters and an inverse relationship was observed between the crystallite size and the energy gap of the ZnO nanoparticles.
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Research Advances of Composite Solder Material Fabricated via Powder Metallurgy Route

Authors: Mohd Arif Anuar Mohd Salleh, Muhammad Hafiz Hazizi, Mohd Mustafa Al Bakri Abdullah, N.Z. Noriman, Ramani Mayapan, Zainal A. Ahmad

Abstract: Researches and studies on composite solder have been done by many researchers in an effort to develop viable lead-free solders which can replace the conventional lead-based solders as lead is considered as toxic. Solder materials developed by composite approach showed improvement in their properties and importantly it improved their service performance when compared with solder materials developed by other methods. This paper reviews the solder properties of various types of composite lead-free solder that were fabricated via powder metallurgy route. The fabrication processes of the composite solder material by using powder metallurgy route which involved mixing the powder homogeneously, compaction of the mixed powder and sintering the green body were discussed in detail. The types of reinforcements used in order to enhance its properties and the roles of the reinforcement used were also discussed in detail. Properties of a desirable composite solder and the effects of the reinforcement addition to the composite solder microstructure, changes in its wettability and improvement of its mechanical properties were later discussed in this paper. In conclusion, by reviewing various research advances in composite solder material, a solder material with high solder joint reliability at elevated temperature have yet to be found. Thus, a novel composite solder material with higher solder joint reliability at room and elevated temperature was proposed.
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Research Development of Solder Materials and its Intermetallic Compound (IMC) Study

Authors: Mohd Arif Anuar Mohd Salleh, N.S. Ibrahim, N. Saud, Mohd Mustafa Al Bakri Abdullah, N.Z. Noriman, Ramani Mayapan, Z.A. Ahmad

Abstract: Nowadays, the formation and the subsequent growth of the intermetallic compounds (IMCs) and the development of new lead-free solder systems is a major issue in soldering. The excessive growth formation of intermetallic compounds will increase the brittleness of solder joints and detrimentally affects its mechanical properties. This paper reviews the latest fabrication method for solder materials and the literatures of bulk IMCs study in most solder materials by other researchers. Explanation on solder fabrication by using powder metallurgy method to produce solder materials and IMCs study were explained in detail in this paper.

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The Effects of Tensile and Morphological Properties of Styrene Butadiene Rubber/Recycled Chloroprene Rubber (SBR/CRr) Blends

Authors: Ahmad Azmi Azrem, N.Z. Noriman, M.N. Razif, Mohd Arif Anuar Mohd Salleh

Abstract: The effects of tensile and morphological properties of styrene butadiene rubber/virgin chloroprene rubber blends (SBR/CRv) and styrene butadiene rubber/recycled chloroprene rubber blends (SBR/CRr) were investigated. The range size of CRr used in this study was 0.3 0.7 mm. Both SBR/CRv blends and SBR/CRr blends were prepared using two roll mill at room temperature with blend ratios 95/5, 85/15, 75/25, 65/35 and 50/50. It can be observed that, the tensile strength and elongation at break of SBR/CRr blends show higher value than SBR/CRv blends particularly up to 15 phr of CRr in the blends. However, SBR/CRr blends shows higher value of tensile modulus (M100) than SBR/CRv blends at all blend ratios. The scanning electron microscopy (SEM) of tensile fracture surface of SBR/CRr blends at 50 blend ratios illustrated a better adhesion and dispersion in comparison with SBR/CRv blends.
Keywords: chloroprene rubber, recycled chloroprene rubber, styrene butadiene rubber, tensile properties, SEM
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Characteristics of Corrosion Degradation in Carbon Steel Pipelines

Authors: Mustaffa Bt Zahiraniza

Abstract: This paper presents a probabilistic methodology in evaluating corrosion defect characteristics of carbon steels offshore pipelines. A nonlinear multivariate regression model was selected to describe the correlation among corrosion defect parameters while the least-squares method was used to minimize its residuals. The proposed framework were able to provide better insights on the degree of correlations among corrosion defect parameters, which eventually proven that the interactions among defects are indeed significant.
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Bacillus megaterium sp. as Degradation Agent for Biodegradable Natural Rubber Latex Films

Authors: Z.M.F Tajuddin, A. Rashid Azura

Abstract: Degradation for biodegradable natural rubber (NRL) films by *Bacillus megaterium sp.* is investigated. A common soil bacterium, *Bacillus megaterium sp.* is one of the largest eubacteria. This bacterium has large potential in degradation process for biodegradable natural rubber latex film. Specified method is used to cultivate the bacteria using suitable media. The growth of bacteria is studied through optical density and dry weight as a function of time. The optical density at specific wavelength with different stages of bacterial growth is used to determine their mid-log growth phase of the cell. The optimum time achieved to insert NRL films is between 17 to 20 hours of

incubation period. Growth curve of *Bacillus megaterium sp.* gives an equation of Y=2.3401X. The biodegradation behaviour of *Bacillus megaterium sp.* is further investigated to access the viability as accelerating media for biodegradation of NRL films.
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Effect of Nanosilica Fillers on the Cure Characteristics and Mechanical Properties of Natural Rubber Composites

Authors: Makara Lay, A. Rashid Azura, Nadras Othman, Yasuyuki Tezuka, Chhorda Pen

Abstract: In recent years, polymer/nanofiller composites have received intense attention and become a core focus of nanoscience and nanotechnology. In polymer-nanoscale filler composites research, the primary goal is to enhance the strength and toughness of polymeric components using molecular or nanoscale reinforcement. In this study, nanosilica was used as filler with various loading from 1-5 phr to enhance mechanical properties and cure characteristics of natural rubber composites. 3 phr of nanosilica filler loadings showed highest tensile strength and shortest cure time compared to the other filler loadings. Tear strength was improved with increasing filler loadings. The effect of nanosilica loading has been analyzed using FTIR characterization and the tensile fracture was investigated by SEM analysis.
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Synthesis of Porous Silica via Styrene Natural Rubber Sacrificial Template

Authors: Y.S. Nurfatihah, A.B.B. Alwi, A. Rashid Azura, Zulkifli Ahmad

Abstract: Synthesis of porous silica via styrene natural rubber sacrificial template is investigated. This research is divided into three steps which are synthesis of Styrene Natural Rubber (SNR), SNR/silica film formation and formation of porous silica. The synthesis of SNR is obtained via emulsion polymerization which involves styrene as monomer and Deproteinized Natural Rubber (DPNR) latex as based materials. SNR is used as sacrificial template to produce porous silica. The amount of silica loading and mixing method were varied during formation of SNR/silica film. Calcination is use to completely remove styrene and latex, leaving behind a new material with porous structure. It was found that the increasing of silica loading will enhanced the porosity of the structure and the best mixing method can be obtained using shaker instead of mechanical stirrer and magnetic stirrer. The porous structure can be observed via Scanning Electron Microscopy (SEM).
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The Effects of Kenaf Loadings and 3-aminopropyltriethoxysilane (APTES) Coupling Agent on Mechanical Properties of Polypropylene/Waste Tire Dust/Kenaf (Pp/WTD/KNF) Composites

Authors: Ai Ling Pang, Hanafi Ismail

Abstract: The mechanical properties of polypropylene (PP)/waste tire dust (WTD)/kenaf (KNF) composites with and without 3-aminopropyltriethoxysilane (APTES) coupling agent were investigated. The composites were prepared using a Thermo Haake Polydrive internal mixer, where different KNF loading (0, 5, 10, 15, 20 phr) were used. The results revealed that the tensile modulus increased with increasing KNF loading but tensile strength and elongation at break were found decreased. Composites with APTES give higher tensile strength and modulus but lower elongation at break than composites without APTES. The presence of APTES enhanced the interfacial adhesion between PP/WTD matrices and KNF which result in higher tensile strength and modulus of the composites. These findings were supported by the morphological study of the tensile fractured surfaces of the composites.
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Iodine Doping of Amorphous Carbon Thin Films Deposited by Thermal CVD

Authors: K. Dayana, A.N. Fadzilah, Mohamad Rusop

Abstract: A simple thermal chemical vapor deposition method is employed for the deposition of amorphous carbon thin films by natural precursor camphor oil onto the glass substrates and the iodine doping process. In this work, we have studied the effect of iodine doping on the evolution of electrical properties and the optical and structural properties of amorphous carbon thin films. The amorphous carbon thin films were characterized by using Raman spectroscopy, UV-VIS-NIR spectroscopy, current-voltage (I-V) measurement, Fourier transform infrared (FTIR) and FESEM. The I-V study reveals that the electrical conductivity was increased with the iodine doping. The iodine doped thin films induced graphitization by decreasing the optical band gap. Raman and FTIR result indicates that amorphous carbon thin films consist of a mixture of sp^2 and sp^3 bonded carbon atoms. The FESEM shows the amorphous nature of the thin films.
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Effect of Curing Regime on Compressive Strength of Concrete Containing Malaysian Laterite Aggregate

Authors: Norul Wahida Kamaruzaman, Khairunisa Muthusamy

Abstract: Concrete subjected to improper curing process would exhibit poor strength performance due to incomplete hydration process. This research investigate the effect of curing regime towards compressive strength of concrete containing Malaysian laterite aggregate (MLA) as partial coarse aggregate replacement. Concrete specimens produced using a range of laterite aggregate replacement from 0 to 50% were placed in different curing regime namely water curing, natural weather curing and air curing until the testing date. Specimens were subjected to compressive strength test in accordance to BS EN 12390 at 60 days. The results show strength of all specimens except the air cured samples increase as the curing age become longer. It was found that water curing is the most suitable for better performance of laterite concrete. The presence of

water throughout the curing process is very much crucial for laterite concrete strength developement compared to normal concrete.
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Abstract: This paper reviews and summarizes the current knowledge and application of clay as a geopolymer material in production of geopolymer brick. As we understand, the nature of source materials give a significant impact to the strength of geopolymer. For example, geopolymer made from calcined source material such as calcined kaolin, fly ash, ground granulated blastfurnace slag (GGBS) and others produce a higher compressive strength compared to geopolymer made from non-calcined source material such as kaolin. This paper is reviewing on the suitability of clay application as a geopolymer material in geopolymer brick production. The chemical composition of clay-based material show high content of SiO_2 and Al_2O_3 compound which is similar to the fly ash. Clay-based Geopolymer showed a good potential in a brick production.
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Abstract: In this Study, the Degradability of Low Linear Density Polyethylene (LLDPE) and Soy Spent Powder Blends under Outdoor Exposure of Malaysia. Cobalt Stearate Was Used as a Pro-Oxidant. the Degradation of the Blends Was Observed by Monitoring the Changes in the Tensile Properties and Molecular Weight. the Degradability of the Blends Was Also Accelerated by the Addition of Pro-Oxidant.
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Abstract: This study presents the preparation of activated carbon from durian shell (DShAC) and durian seed (DSeAC) based by chemical activation with potassium hydroxide (KOH) as an activating agent under the nitrogen flow. In order to find the optimum physical characteristics, variation in concentration of KOH, carbonization temperature and duration time was employed. The result shows that activated carbon from durian waste is a promising activated carbon as the highest yield was obtained from the carbonization process that occurs at 400C for four hours with the KOH concentration is 0.6 M.
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Abstract: Aggregates are popular for use in concrete and lightweight concrete applications. Recent research shows that the by-product materials such as fly ash can be used as raw material in producing aggregates and lightweight aggregates. The usage of this material can improve the quality of the aggregates produced compared to

conventional in term of structurally strong, physically stable, durable, and environmentally inert. This paper summarized the process and mechanical testing on the fly ash aggregates and lightweight aggregates to be used in concrete.
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A Three Dimensional Finite Element of Anterior Cruciate Ligament Model

Authors: A.H. Alafiah, M. Normahira, M.N. Anas

Abstract: Anterior Cruciate Ligament (ACL) is of the major knee ligament. A three dimensional model that reflects the geometric characteristics of the human ACL developed to explore and analyze finite element parameters such as contact pressure and stress distribution on ACL in response to complex loading conditions. Moreover, various cases studied such as cases involving and uninvolving ligament in order to obtain and analyze the stress and contact pressure relationship between ACL, meniscus and cartilage. It is known that the contact and friction caused by the ACL wrapping around the bone during knee motion played the role of transferring the force from the ACL to the bone, and had a direct effect on the stress distribution of the ACL. Thus, the project lead to better understand the mechanism of injury, to improve the design of ACL reconstruction using suitable material and optimizing rehabilitation protocols by investigation of contact pressure with and without ACL.
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Development of Bioreactor System for Generating Three-Dimensional (3D) Tissue Engineering

Authors: S. Rad, M. Normahira, M.N. Anas

Abstract: In this study, perfusion bioreactor has been employed for generating a three dimensional (3D) tissue engineering. In flow perfusion culture, the culture medium is forced through the internal porous network of the scaffold. This can mitigate internal diffusional limitations present in 3D scaffold to enhance nutrient delivery and waste removal from the cultured cells. In order to validate this design, a fluid flow analysis has been conducted to show that it has a uniform flow distribution value for cell cultured conditions. This bioreactor system also equip with the temperature controller system to ensure the bioreactor temperature is always at 37°C in order to mimic human body temperature.
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Synthesis of Eu^{2+}, Dy^{3+} Co-Doped MAl_2O_4 Phosphor (M = Ba, Sr) by *In Situ* Self-Propagating High Temperature Synthesis

Authors: Taschaporn Sathaporn, Niyomwas Sutham

Abstract: Eu^{2+}, Dy^{3+} co-doped alkaline earth aluminates MAl_2O_4: Eu^{2+}, Dy^{3+} (M = Ba, Sr) have been prepared by *in situ* self-propagating high temperature synthesis (SHS) method. The influence of co-doping rare earth ions (Eu^{2+}, Dy^{3+}) on the luminescence of MAl_2O_4:Eu^{2+}, Dy^{3+} were described in this study. The particles morphology, photoluminescence and afterglow properties of the phosphors were studied. Broad

band UV excited luminescence was observed for $BaAl_2O_4:Eu^{2+}$, Dy^{3+} and $SrAl_2O_4:Eu^{2+}$, Dy^{3+} in the green region peak at $_{max}$ = 503 nm and 523 nm, respectively. The dopant (Eu^{2+}) and co-dopant (Dy^{3+}) concentrations affect the crystallinity and luminescence properties of the materials.
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X-Ray Powder Diffraction Studies of Mechanically Milled Cobalt

Authors: W.S. Yeo, Z. Nur Amirah, H.S.C. Metselaar, T.H. Ong

Abstract: The allotropic phase transformation of cobalt powder prepared by high-energy ball milling was investigated as a function of milling time. Measurement of crystallite size and micro-strain in the powder systems milled for different times were conducted by X-ray diffractometry. The X-ray diffraction (XRD) peaks were analyzed using the Pearson VII profile function in conjunction with Rietveld method. X-ray diffraction line broadening revealed that allotropic transformation between face-centred-cubic phase (fcc) and hexagonal close-packed phase (hcp) in cobalt is grain size dependent and also on the accumulation of structure defects. The results showed that the phase formation of cobalt depends on the mill intensity that influences of both the grain size and the accumulation of structure defects. However, this theory alone is not adequate to explain the effects in this work. It was found that the total surface energy (Ω) theory satisfactorily explains the phase transformation behavior of cobalt. The smaller value of surface energy (Ω) of the fcc crystal than the hcp phase when size decreases may alter the qualitative aspects of the phase formation.
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Feasibility of Producing Wood Fibre-Reinforced Geopolymer Composites (WFRGC)

Authors: Mohd Mustafa Al Bakri Abdullah, Ahmad Mohd Izzat, M.T. Muhammad Faheem, H. Kamarudin, I. Khairul Nizar, M. Bnhussain, A.R. Rafiza, Yahya Zarina, J. Liyana

Abstract: Wood fibres have long been known as a fibre reinforcement for concrete. Due to its availability and low production cost, this natural fibre has been used in less developed country where conventional construction materials were very expensive. In Japan, the production of these types of composites such as high performance fibre-reinforced cement-based composite (HPFRCB), ultra high performance (UHPFRCB) and strain-hardening (SHCC) fibre-reinforced cement-based composite has been developed rapidly in last decades. Geopolymer, future composite and cement produced by the alkali-activation reaction is well known as a potential replacement to Ordinary Portland Cement. This study aims at studying the possibility to produce wood fibre-reinforced geopolymer composite (WFRGC). The various percentage of fibre have been made from 10% to 50% and cured at 60C, tested for compressive strength for 7^{th} and 14^{th} day and the microstructure examined using SEM. The density and water absorption test have been performed. The results showed are encouraging and indicate the feasibility of producing a wood fibre-reinforced geopolymer composite (WFRGC).

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Strength and Microstructural Properties of Mechanically-Activated Kaolin Geopolymers

Authors: C.Y. Heah, Kamarudin Hussin, Mohd Mustafa Al Bakri Abdullah, M. Bnhussain, Luqman Musa, I. Khairul Nizar, Che Mohd Ruzaidi Ghazali, Y.M. Liew

Abstract: Kaolin geopolymers exhibit low strength properties due to its plate-like nature which contribute to smaller surface area for geopolymerization reactions. Layered kaolin structure only allows very little, if any, substitution of other elements. Therefore, mechanical activation is an alternative way to break the kaolin structure to become finer to change the morphological features to smoother surface, and to cause edge distortion to the kaolin particles. Rounded particles also can be produced using this technique. This mechanically-activated kaolin was used to produce mechanically-activated kaolin geopolymers in this study. From the results, compressive strength increased as mechanical activation time increased and the compressive strength increased with the ageing day. The SEM micrograph showed that the mechanically-activated kaolin geopolymers have denser structure which complies with the compressive strength measured.

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Effect of Curing Regimes on Metakaolin Geopolymer Pastes Produced from Geopolymer Powder

Authors: Yun Ming Liew, Kamarudin Hussin, Mohd Mustafa Al Bakri Abdullah, Mohammed Binhussain, Luqman Musa, Ismail Khairul Nizar, Che Mohd Ruzaidi Ghazali, C.Y. Heah

Abstract: The properties of metakaolin geopolymer paste are affected by the alkali concentration, the initial raw materials, solidification process, and amount of mixing water as well as the curing conditions. This study aimed to investigate the effect of curing temperature (room temperature, 40°C, 60°C, 80°C and 100°C) and curing time (6h, 12h, 24h, 48h and 72h) on the geopolymer pastes produced from geopolymer powder. The results showed that curing at room temperature was unfeasible. Heat was required for the geopolymerization process, where strength increased as the curing temperature was increased. Moderate elevated curing temperature favored the strength development of geopolymer pastes in comparison with those treated with extreme elevated curing temperature. When geopolymer paste was subjected to extreme elevated curing temperature, shorter curing time should be used to avoid deterioration in strength gain. Similarly, longer curing time was recommended for moderate elevated curing temperature. The microstructure of geopolymer paste cured at moderate curing temperature showed obvious densification of structure. In contrast, the structure formed was weak and less compact at very high elevated curing temperature.

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the nanostructures were calculated from full width half maximum (FWHM) of (101) peak in XRD patterns and the size is around 42 nm. PL measuremment were carried out and the near band edge emission (NBE) is increase in wavelength or namely redshifted. Moreover, deep band emission (DBE) is observed at 520 nm for ZnO annealed in nitrogen, which commonly regarded as the defect level of oxygen vacancies. The investigation continues with conducting transmission electron microscopy (TEM) to demonstrate the mophology of as grown nanostructures and annealed in both nitrogen and oxygen ambient.
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electronic industry, the electronic components that exceed 70°C will malfunction and damage due to the overheated. The design is used nanosilver as main material in thermo pad because it has high value of thermal conductivity and enables to dissipate heat very efficiently. The simulation of thermal pad in semiconductor is using FLUENT™ software. The results from simulation is been compared to the results from experiment. The differences between those results are less than 10%. The advantages of thermal pad are enables to reduce junction temperature of PLCC 20-30%. It also had constant thickness in order to get constant and accurate results.
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Synergistic Effect on Flexural Properties of Kenaf-Glass Hybrid Composite

Authors: Atiqah Afdzaluddin, Md Abdul Maleque, Mohammed Iqbal

Abstract: This paper presents the synergistic effect on flexural properties of kenaf-glass (KG) mat reinforced unsaturated polyester (UPE) hybrid composite which can compounded using sheet molding compound (SMC) process. The matrix is kept constant with 70 % volume fraction while kenaf and glass fibers were varied, such as 7.5/22.5 v/v, 15/15 v/v and 22.5/7.5 v/v. The 30 % kenaf and 30 % glass are also used for the preparation of composite materials. The kenaf mat was treated with 6% sodium hydroxide (NaOH) diluted solution for 3 hours. This mercerization process improved the interface by interacting with both the fiber and its matrix. The flexural test was performed using ASTM D790-03 standard. The study showed with the addition of kenaf and glass mat 15/15 v/v, the optimum flexural properties was obtained compared to other composition. This can be concluded that 15/15 v/v KG mat reinforced unsaturated polyester hybrid composite is the most appropriate hybrid composite which can be considered for many engineering structural applications mainly in automotive panel, bottom structure and bumper beam.
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Effect of Blockage Size on Pipe Vibration

Authors: N. Liyana Tajul Lile, M.J. Hasnul, R.A. Siregar, J.C. Leong

Abstract: Circular pipes are widely used to convey goods to a desired location. Flow inside a pipe needs to be smoothed and unobstructed to ensure an optimize flow of particle. However, pipes are prone to clogging or blocking due to deposition of unwanted impurities and external objects. Built up inside a circular pipe will affect the flow velocity and pressure within the pipe. This paper presents a method of assessing blockage inside a pipe by using vibration analysis. The effect of blockage was observed through changes in pipe vibration response and also turbulence intensity. The changes in vibration parameters were identified together with the reduction of flow area due to increasing blockage size.
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Review of Extraction of Silica from Agricultural Wastes Using Acid Leaching Treatment

Authors: Che Pa Faizul, C. Abdullah, B. Fazlul

Abstract: Large quantities of agricultural wastes such as palm ash and rice husk are found in Malaysia, have a large possibility to be employed as usefully renewable to produce energy and silica (SiO_2). Extensive researches have been carried out to extract silica from agricultural wastes such rice husk, because silica is useful raw material for industrial application. In the previous studies, the strong acid leaching treatment was carried out on rice husk to remove metallic impurities and organics contained in them. Leaching treatment is a proper route to extract the silica. Sulphuric acid (H_2SO_4), hydrochloric acid (HCl) and nitric acid (HNO_3) solutions are conventionally used in leaching treatment to prepare silica materials [. A strong acid leaching treatment, however, is significantly hazardous to the environment and humans. This paper reviews the common extraction method used and the latest research trends in extraction of silica.

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Study on Milling Periods on the Iron Mill Scale Particle Size and Properties

Authors: Ruhiyuddin Mohd Zaki, Che Pa Faizul, Darus Murizam, A.R.M. Nazri

Abstract: The relations between the milling periods with the iron mill scale particle size have been studied. Iron mill scale has been chosen for this research due to the nature of itself, as a by-product. From this research, the average optimum size for the final iron mill scale particle size intended to produce is at 300 μm. Raw iron mill scale received from the industries was in the form of chip with the average size of 10 mm across and 1.5 mm thickness. Three different samples from three different steel mill companies have been used for this study. Rolling ball mill has been used to mill the iron mill scale with two different milling periods, which were two hours and six hours. After the milling process, the iron mill scale was sieved using sieving machine to a few specified grating sizes. Weight of each sample collected from each grating size was calculated in order to get the percentage of the particle size distribution of the iron mill scale after the milling process. Sample collected from Steel Mill 1 (SM1) and Steel Mill 3 (SM3) showing finer particle size produced after the milling period of six hours as compared to two hours. However sample from Steel Mill 2 (SM2) showing different trend of particle size collected as compared to SM1 and SM3. Coarser particle size was collected after the milling periods of six hours as compared to two hours. Characterization process have been conducted to all mill scale samples from each steel mill company in order to determine the relationship between the mill scale properties and the result gathered after the milling process.

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Potential Application of Palm Ash as a Raw Materials in Production of Green Glass

Authors: Hidayu Jamil Noorina, Mohd Mustafa Al Bakri Abdullah, Che Pa Faizul, Ruhiyuddin Mohd Zaki, Darus Murizam, Che Mohd Ruzaidi Ghazali, Mohamed Nor Mohamed Faisol

Abstract: Oil Palm Ash is one of the abundance agricultural wastes found in Malaysia. This wastes need to be disposed properly. Oil palm ash contains compounds needed to produce glass. Most of raw materials (especially silica) used to produce existing commercial glass are imported; therefore it is the best time to highlight the potential of local natural waste as the raw material in glass production. In this study, raw material characterization, glass production and glass product evaluation has been done. A few parameters have been recognized to have effect on green glass production such as mixing compositions and firing temperature. Oil palm ash has been washed and dried then sieved to get uniformity of particle size. Then, oil palm ash is mixed with other glass materials such as alumina and flux and undergone melting process at 1400°C. Through the experiments, the best glass compositions are as follows: 80% palm ash, 10% kaolin and 10% feldspar or 10% dolomite while the suitable temperature being used for sintering process to produced end product is range between 1150°C to 1200°.
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The Effects of Rattan Filler Loadings on Mechanical Properties and Morphological Study of Rattan Powder Filled-Polypropylene Composites

Authors: Nurshamila Shaari Balakrishna, Hanafi Ismail, Nadras Othman

Abstract: Effects of filler loading were investigated in rattan powder-filled polypropylene composites. The composites were melt-blended using a Polydrive Thermo Haake internal mixer by incorporating rattan powder into polypropylene matrix. Rattan powders used were of average size 180μm with filler loadings ranging between 0 to 40 phr. The results indicate that tensile strength and elongation at break show a decrease with increasing filler loading. Tensile modulus increased with addition of rattan powder and eventually decreased with high filler loading. This is due to higher rattan powder content has more tendency to agglomerate causing weaker interfacial adhesion between rattan filler and polypropylene matrix. The deterioration in tensile properties was confirmed by morphological studies of fractured surfaces.
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Effect of Pyrolysis on the Wettability Behaviour of Polyethylene Terephthalate on Petroleum Coke

Authors: Syed Bakar Sharifah Shahnaz, Rita Khanna, Sahajwalla Veena, Hussin Kamarudin, N.Z. Noimam, Sung Ting Sam

Abstract: In depth investigations has been carried out on thermoplastic polymers, polyethylene terephthalate (PET). The interaction between PET and PC substrate was studied to investigate the effect of oxygen-containing polymer on the polymer melt wetting properties. The effect of two main parameters, temperature ranging from 300°C to 400°C and time from 30 min to 60 min on the polymer properties and the effect of petroleum coke presence on the degradation process of polymer have been

characterized. PET has showed high wettability and deep penetration of melt flow into petroleum coke substrate, which increased as time and temperature were increased.
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Experimental of Wood Gasification in Suction Biomass Gasifier

Authors: Muhammad Iqbal Ahmad, Zainal Alimuddin Zainal Alauddin, Shahril Nizam Mohamed Soid, Mohamed Mazlan, Mohd Huzaifah Yusoff

Abstract: Biomass is one of the alternatives energy which are abundant, relatively cheap, and widespread availability. This paper is aim to show the process finding according experimental work of wood using suction biomass gasifier. Energy can be extracted from biomass through gasification process. The experiment focuses on woody gasification. A suction biomass gasifier has been built and operated under stable condition which fueled from wood waste and air as gasifying agent. The biomass feeding rate was varied from 3 to 5.5kg/hr. Result show that producer gas contains CO in 20-30% in volume and H_2 found to be varying between 14 and16% vol. The low heating value (LHV) from this woody gasification around 4-5 MJ/Nm^3. Carbon conversion efficiency also measured as a parameter to indicate biomass-gas conversion.
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Nano-Optical Fiber Evanescent Field Sensors

Authors: Radhi M. Chyad, Mohd Zubir Mat Jafri, Kamarulazizi Ibrahim

Abstract: The nanofiber optic evanescent field sensor based on a changed cladding part as a sensor presented numerically. The influences of numerical opening, core radius of the fiber, the wavelength is effected on the light source and the submicron fiber on the sensors are promise to studied in this work. The results pointed out the sensitivity of the sensor increases when the numerical opening of the fiber is increases and the core radius is decreases. The NA of the fiber affects the sensitivity of the sensor. In the uniform core fiber, the increase in the NA increases the sensitivity of the sensor. Therefore, one should choose a fiber with high NA for the design of an evanescent-wave-absorption sensor if the core of the sensing segment uniform in diameter, so that the increase in the penetration depth or number of ray reflections or both, increases the evanescent absorption field and hence the sensitivity of the sensors. Keywords*:* fiber optic sensor, chemical sensors, biosensors, nanofiber optic.
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FT-IR and Morphology of Different Recycled Acrylonitrile-Butadiene Rubber Glove (NBRgr) Size and its Blend Ratios of SBR/NBRr Blends

Authors: I. Lokman Hakim, N.Z. Noimam, Hanafi Ismail, S.T. Sam, Mohd Arif Anuar Mohd Salleh, Hamzah Rosniza

Abstract: Recycling rubber waste contributes to a cleaner environment by using indestructible rubber discards as well as lowering production costs as reclaimed rubber is cheaper than virgin or natural rubber. Therefore, in this study, the properties of

recycled acrylonitrile butadiene rubber glove (NBRgr) blending with styrene butadiene rubber (SBR) has been determined. The effects of SBR/NBRr blends on properties of such fourier transform infrared (FT-IR) and morphology properties were carried out. FT-IR analysis showed that SBR/NBRr R05 blended with the smallest size NBRr (S1) and showed most intense amine absorption at 1535 $cm^{-1.}$ The intensity decreased by increasing the NBRr sizes. By incorporating the smallest size NBRr provided more surface area to interact with SBR polymers thus increased the level of crosslink. From scanning electron microscopy (SEM) observation on fatigue failure surface, the SBR/NBRr blended with the finest size of NBRr (S1) showed roughest matrix tearing compared to S2 and S3 indicated better fatigue propagation. At higher blend ratio (50/50), the SBR/NBRr blended with S2 and S3 exhibited a coarser and a poorer distribution of NBRr with SBR matrix which led to lower fatigue life.
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On the Crushing Behavior of Foam-Filled Composite Tubes under Compressive Loading

Authors: Akbar Othman, Shahrum Abdullah, Ahmad Kamal Ariffin, Nik Abdullah Nik Mohamed, Helmi Rashid

Abstract: The present papers determine the effect of composite pultrusion square tubes E-glass polyester empty and polymeric foam-filled subjected to axial compressive loading. The specimens of square composite pultrusion were compressed experimentally under axial loadings to examine the effect of empty and polymeric foam-filled with different wall-thickness. The wall-thickness was used in this study were 2.1 and 2.4 mm. During the experimental observation, three characteristic crushing stages were identified as initial peak load, progressive crushing and compaction zone stages. The composite pultrusion square tube profile were analyzed and investigated in terms of crashworthiness parameters to meet the improvement of structural material widely used in automobile, aerospace and marine applications. Result obtained from experimental analysis such that initial peak load, mean load, energy absorption and specific energy absorption versus displacement curves were compared for each specimen. Results showed that the tubes energy absorption was affected significantly by different tube profile. It is also found that the polymeric foam-filled exhibit superb crashworthy structure on specific absorbed energy and the amount of initial peak load, mean load and absorbed energy recorded higher than the empty tube profiles.
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Fabrication of Nanowire Using Ash Trimming Technique

Authors: Tijjani Adam, U. Hashim, Pei Ling Leow, Q. Humayun

Abstract: The paper present a report on fabrication of Nanowire using plasma oxidation, we monitor changes by studying the morphology and Δw / Δh, the study also revealed that the proposed fabrication method could potentially be used to fabricate specific nanometer-scale structure and space structure with uniform surface morphology without any damage to the photoresist. Yet with reduced ashing time and without popping of the

photoresist ashing process when the a fabricated is being carried out and subsequently trimmed to nanosize by plasma oxidation, the study also revealed the dramatic increase in aspect ratio as the structure reduces in lateral dimension.
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Low Density Polyethylene (LDPE)/Thermoplastic Sago Starch (TPSS) Blend Filled with Kenaf Core Fiber (KCF)

Authors: Norshahida Sarifuddin, Hanafi Ismail, Ahmad Zuraida

Abstract: Recently, blending of common hydrocarbon polymer with natural based materials has gain much interest towards the development of degradable composite. In this study, a series of low density polyethylene (LDPE)/thermoplastic sago starch (TPSS) blend reinforced with kenaf core fiber (KCF) with starch content ranging from 10 to 40 % were prepared via melt-blending method. For this study, kenaf loading was fixed at 20 % (by weight). The blended samples were characterized by means of tensile test and morphological study. The experimental result shows that there is a gradual decrease in tensile strength, modulus and elongation at break with increase in starch loading. The scanning electron micrograph (SEM) supports the findings of tensile properties.
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Effects of Calcination Temperature of LUSI Mud on the Compressive Strength of Geopolymer Mortar

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Keywords: LUSI mud, calcinations temperature, compressive strength, geopolymer mortar

Abstract. The abundant availability of LUSI (a short form of LUmpur SIdoarjo or Sidoarjo mud) mud of a mud volcano located in Sidoarjo, East Java, Indonesia, attracts interest of researchers to seek the possibility of utilizing it; among them is as construction material. This study focuses on the effect of calcinations temperatures of LUSI mud on the compressive strength of geopolymer mortar. Three different calcinations temperatures were investigated, i.e. 700, 800 and 900^{o}C for five hours duration. Characterization of the mud, both the original and the calcined ones, was performed by using X-ray Diffraction (XRD) and X-ray Fluoresence (XRF) analyses. The calcined LUSI mud was then employed as precursor for making geopolymer mortar, and tested for its 7-day compressive strength. It is found that calcinations at 800^{o}C is the optimum calcinations temperature producing the highest compressive strength.

Introduction

Since May 2006, a mud volcano in Sidoarjo, East Java, Indonesia, continues to erupt, producing mud which has covered more than 640 hectares of fertile land, industrial and housing areas, as well schools and other infrastructure facilities. The mud, nicknamed LUSI (a short form of *Lu*mpur *Si*doarjo or Sidoarjo mud) is predicted to flow out not less than 41 years with 50% chance [1].

The mud volcano has discharged approximately$18*10^4$ m^3 per day of mud in its peak in 2007, and it continues till present, although the volume is decreasing to about 10^4 m^3 per day. Several attempts have been done to end the eruption, however to date none was successful. Currently, the height of the cover dam is about 12 meters, although some of the mud has been channeled to a nearby river.

Attempts to utilize the mud as construction materials were mostly carried out to partially replace the use of cement in making concrete as pozzolanic material [2-4]. This is reasonable as it was found to contain SiO_2 ~ 55%, Al_2O_3 ~ 20% and Fe_2O_3 ~ 10% [4], although recently it was revealed that its main chemical composition shifted to SiO_2 ~ 30%, Al_2O_3 ~ 6% and Fe_2O_3 ~ 43% [2, 3]. The mud becomes more reactive after undergone calcinations, as its microstructure changed from crystalline into more amorphous form [3, 4]. Calcinations or sintering is a common practice to increase the pozzolanic activity of a pozzolanic material [5].

Nuruddin et al [4] found that calcinations at 600^{o}C for one hour duration was the most effective to convert the mud to become a reactive pozzolanic material, with 10% cement replacement resulted in the highest compressive strength. The authors previous study [2] reported that by calcinations at 900^{o}C for five hours, with particle size less than 63μm, successfully enabled the use of up to 40% LUSI mud to partially replace the use of cement in making mortar.

As most of pozzolanic materials are also potentially used as a precursor for geopolymer [6], this LUSI mud should be a strong candidate for it as well. From SEM results, it was found that LUSI is dominated by clay minerals, whereby its particle size is less than 10μm. The shape of the particle is plate-like structure [7]. However, without calcinations the mud is un-reactive due to its crystalline microstructure [8], and thus it needs heat treatment before use.

This paper focuses on the effect of calcinations temperature of LUSI mud on its microstructure and on the compressive strength of LUSI mud-based geopolymer mortar

Experimental Program

Materials. Locally available granite type river sand was used throughout the study. The specific gravity of the sand was 2.603, while the fineness modulus (FM) was 2.16. LUSI mud was collected directly from the site of mud volcano – from point 25, the closest to the center of eruption, in liquid form - in Sidoarjo, East Java, Indonesia. Sodium silicate was obtained in liquid form with Na_2O 17.14% and SiO_2 36.71%, while sodium hydroxide (NaOH) was purchased in flakes form with 98% purity. The water utilized to mix the NAOH flakes was tap water.

Calcinations of the mud. The raw mud was then dried under the sun and molded into bricks-like shape of 30x60x30mm size, and sent to oven at 100^{o}C for 24 hours for further drying. The dry mud in bricks-like shape was then sent for calcinations in a laboratory furnace at three different temperatures, i.e. 700, 800 and 900^{o}C for five hours. Five hour duration was followed to conform with the common practice in calcinations of ceramic tile roof in local manufacturers [2]. After the calcinations period, the calcined mud was allowed to cool down gradually in the furnace until the temperature similar to the outside or surrounding environment. The calcined mud was then sent to a rod-mill machine for grinding for about two hours, and then sieved to obtain fraction with particle size less than 63μm. Characterizations of mud were performed using XRD and XRF analyses.

Design and synthesis of geopolymer mortar. Alkaline solution used was a combination of NaOH and sodium silicate solution. The ratio of NaOH solid:sodium silicate solution was taken as 1:3 by mass. Water to the mud ratio of the geopolymer mortar was fixed at 0.4 by mass. This water is the one used to make the NaOH solution. Sand to LUSI mud ratio by mass was taken as 3:1. This composition was chosen based on the results of a preliminary investigation by the authors. The fresh geopolymer mix was then cast to be mortar cubes samples of 50x50x50mm size, and vibrated on the vibrating table for one minute to expel the air trapped in the fresh mix. Curing was performed in the oven at 100^{o}C for 24 hours. Each compressive strength data of mortar sample was obtained as mean value of the results of three tests performed at the age of 7 days.

Results and Discussion

Mud properties. Table 1 shows the oxides composition of the original and calcined LUSI mud obtained from XRF analysis. The first row shows the chemical composition of the original LUSI mud before calcinations (designated as **BC**), while the second row shows the chemical composition after calcinations (designated as **AC**) at 900^{o}C for five hours.

Table 1. Chemical composition of original and calcined LUSI mud as measured by XRF (% by mass)

	CaO	SiO_2	Al_2O_3	Fe_2O_3	K_2O	SrO	SO_3	MnO	ZnO	CuO	P_2O_5	TiO_2	ZrO_2
BC	7.63	28	5.7	41.42	4.50	0.00	2.1	0.64	0.13	0.27	1.5	2.90	0.33
AC	6.76	36	7.0	39.82	3.96	0.48	0.3	0.57	0.11	0.25	1.9	2.76	0.20

It was found that the most dominant oxides in the mud are SiO_2, Al_2O_3 and Fe_2O_3. The compositions are slightly different to those reported earlier [4], whereby the SiO_2 content was found to be higher, about 55%. Examination on the oxide compositions of the LUSI mud taken from five different places do not give any significant different to those presented in Table 1 [2]. The total amount of SiO_2, Al_2O_3 and Fe_2O_3 is more than 82%, and thus satisfy the requirement for pozzolanic material [9]. Table 1 also shows that after calcinations (**AC**), the percentage of SiO_2 in the mud increases significantly from 28 to 36%. The same tendency is also shown for Al_2O_3.

Figure 1 shows the XRD pattern of the LUSI mud before calcinations, while Figures 2, 3 and 4 exhibit the ones after calcinations at 700, 800 and 900°C for five hours in the laboratory furnace. From the patterns showed, calcinations convert the crystalline micro-structure of LUSI mud into more amorphous or semi-crystalline material.

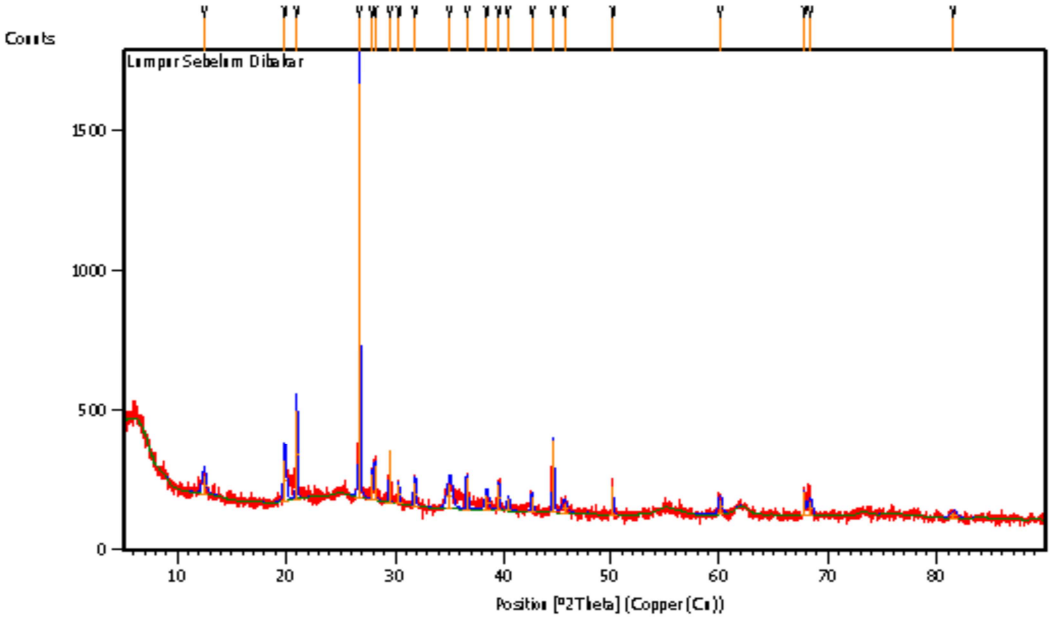

Figure 1. XRD pattern of LUSI mud before calcination

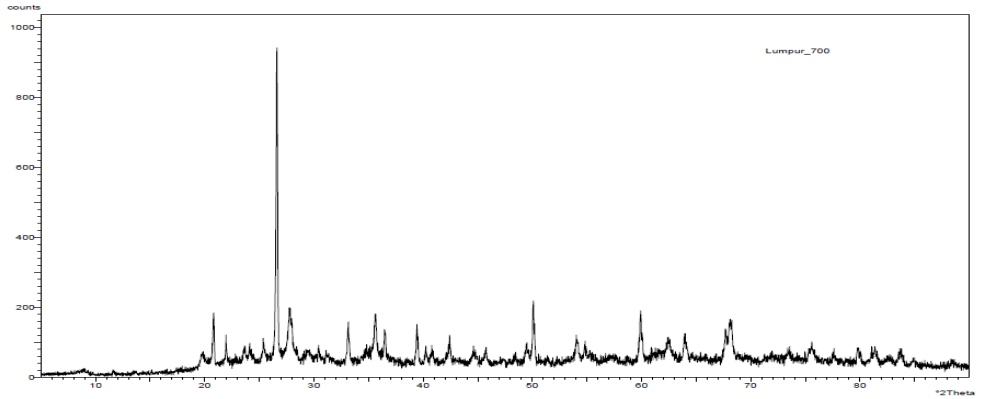

Figure 2. XRD pattern of LUSI mud after calcinations at 700°C

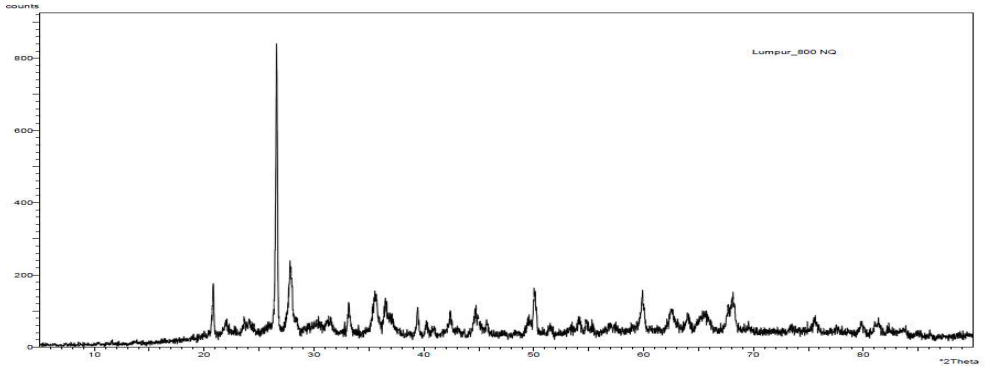

Figure 3. XRD pattern of LUSI mud after calcinations at 800°C

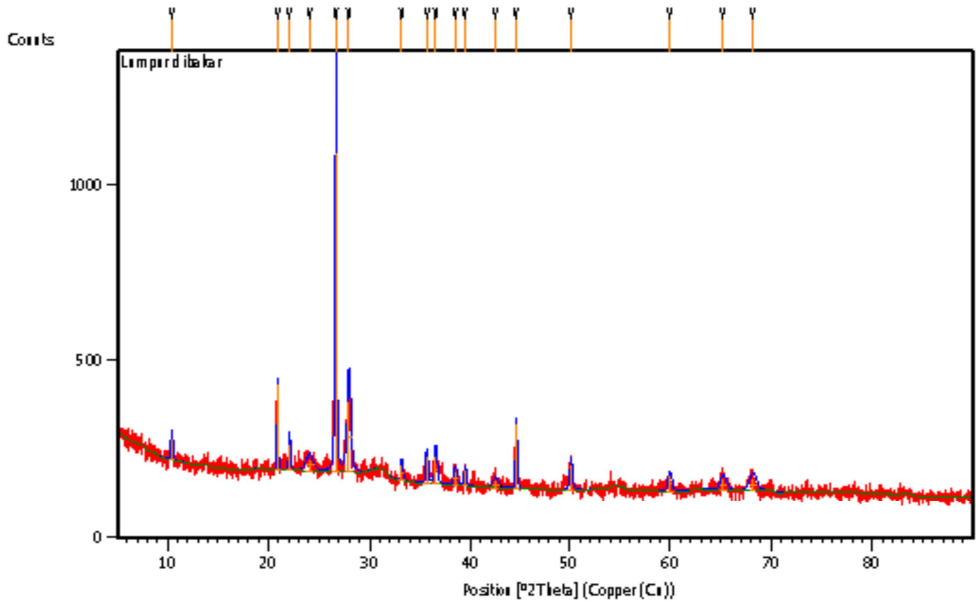

Figure 4. XRD pattern of LUSI mud after calcinations at 900°C

Comparing Figure 2 to 4, it is revealed that calcinations at 800°C seem to be the optimum temperature, as it shows the least intensity of peaks compared to those obtained after calcinations at 700°C and 900°C.

The effect of calcinations temperature to compressive strength of geopolymer mortar. Table 2 shows the compressive strength of geopolymer mortar at 7-day of age manufactured using LUSI mud calcined at three different temperatures, i.e. 700, 800 and 900°C for five hours in the laboratory furnace. The one manufactured from binder calcined at 800°C shows the highest 7-day compressive strength of 36.7MPa. The results confirmed the prediction made after observing the XRD patterns of LUSI mud calcined at different temperatures, i.e. calcinations at 800°C produces the least peaks in the XRD pattern. However, Nuruddin et al [4] found that calcinations of LUSI mud at 600°C produced the optimum pozzolanic material, while Elimbi et al [10], who worked with kaolinite clay, concluded that 700°C was the most convenient temperature for calcinations of source material for geopolymer. Table 2 also shows the unit weight of the mortar samples, which is around 2150 kg/m^3.

Table 2. Effect of calcinations temperature on the compressive strength of geopolymer mortar

	Calcination Temperature		
	700°C	**800°C**	**900°C**
fc' (MPa)	26.60	36.67	18.27
Unit weight (kg/m^3)	2114.7	2185.3	2164

Conclusion

This study investigates the effect of calcinations temperature on LUSI mud to be used as precursor for manufacturing geopolymer mortar. It is found that calcinations at the appropriate temperature converted the originally-crystalline microstructure of LUSI mud into more amorphous or semi-crystalline one. Calcination temperature of 800°C for five hours duration is the optimum calcinations temperature, whereby the intensity of peaks in the XRD pattern reduced significantly. The results is confirmed with the compressive strength of the geopolymer mortar manufactured using the calcined mud, whereby the one produced using mud calcined at 800°C shows the highest compressive strength.

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