bima.kemdikbud.go.id/riwayat-penelitian

BiMA

JULIANA ANGGONO

Dashboard | Penelitian | Pengabdian | Monev | Program Lainnya

Status Didanai

Didanai

Riwayat Penelitian

Riwayat Penelitian Dosen.

1 Modified Sugarcane Bagasse: Their Chemistry, Structure-Property Relationship To Improve Strength Of Biocomposites

Tahun: 2017

Didanai

2 Pengembangan Teknologi Dan Produk Green Composites Serat Tebu-Polypropylene

Tahun: 2014

Didanai

KEMENTERIAN RISET, TEKNOLOGI, DAN PENDIDIKAN TINGGI
DIREKTORAT JENDERAL PENGUATAN RISET DAN PENGEMBANGAN
Direktorat Riset dan Pengabdian Masyarakat
Lt.19 Gedung BPPT II Jalan MH Thamrin No. 8, Jakarta 10340
Telepon: (021) 3169707 Fax: (021) 3102368
Laman: http://ristekdikti.go.id

Nomor : 0045/E3/LL/2018 16 Januari 2018
Lampiran : 5 (lima) berkas
Perihal : Penerima Pendanaan Penelitian dan Pengabdian Masyarakat di Perguruan Tinggi Tahun 2018

Yth. 1. Rektor/ Direktur/Ketua Perguruan Tinggi Negeri dan Swasta
2. Koordinator Kopertis Wilayah I s/d XIV

Sesuai dengan Surat Keputusan Direktur Jenderal Penguatan Riset dan Pengembangan nomor 1/E/KPT/2018 tanggal 3 Januari 2018 tentang Penerima Pendanaan Penelitian dan Pengabdian kepada Masyarakat Perguruan Tinggi Negeri Badan Hukum Tahun 2018, SK Dirjen Penguatan Risbang nomor 2/E/KPT/2018 tanggal 3 Januari 2018 tentang Penerima Pendanaan Pengabdian kepada Masyarakat Tahun 2018 dan SK Dirjen Penguatan Risbang nomor 3 tanggal 3 Januari 2018 tentang Penerima Pendanaan Penelitian Tahun 2018, bersama ini kami sampaikan daftar nama penerima pendanaan Penelitian dan Pengabdian Masyarakat tahun 2018 sebagaimana terlampir.

Kami informasikan bahwa penerima pendanaan program Penelitian dan Pengabdian Masyarakat tahun 2018 adalah pengusul yang proposalnya dinyatakan lolos seleksi, dan yang bersangkutan atau institusi telah memenuhi kewajiban sebagai berikut:

1. Mengunggah Laporan kemajuan tahun 2015 - 2017;
2. Mengunggah Laporan Akhir tahun 2015 - 2017;
3. Mengunggah Berkas Kelengkapan Seminar Hasil tahun 2015 – 2017;
4. Mengunggah proposal lanjutan: Penelitian dan Pengabdian kepada Masyarakat untuk pelaksana *On Going*;
5. Melaksanakan seluruh tahapan seleksi sebagaimana disebutkan dalam Panduan Pelaksanaan Penelitian dan Pengabdian Masyarakat Perguruan Tinggi Edisi XI untuk skema penelitian desentralisasi Perguruan Tinggi.
6. Tidak memiliki tunggakan dokumen sebagaimana terdapat pada surat nomor 4996/E3.4/LT/2017 tanggal 20 Desember 2017
7. Seorang dosen hanya dapat menjadi ketua di satu judul Pengabdian kepada Masyarakat. Agar segera diusulkan penggantian Ketua kepada anggota oleh Ketua LPPM ke DRPM untuk pendanaan Pengabdian kepada Masyarakat yang baru ;
8. Tidak sedang dalam status tugas belajar, baik untuk ketua maupun anggota;
9. Pendanaan penelitian diberikan dengan menperhatikan kuota berdasarkan H-index peneliti.

Berkenaan dengan hal tersebut, DRPM mengucapkan selamat kepada penerima pendanaan Penelitian dan Pengabdian Masyarakat tahun 2018. DRPM mengucapkan terimakasih kepada pengusul yang telah berpartisipasi dan apabila nama pengusul tidak tercantum, maka dapat mengusulkan kembali proposal pendanaan Penelitian dan Pengabdian Masyarakat untuk pendanaan tahun 2019. Selanjutnya, kami mohon bantuan Saudara untuk menyampaikan informasi di atas kepada penerima pendanaan Penelitian dan Pengabdian Masyarakat Tahun 2018 di Perguruan Tinggi masing-masing.

Kami sampaikan bahwa mekanisme penyaluran dana akan dilakukan melalui kontrak kerja antara DRPM dengan Ketua LP/LPPM/LPM Perguruan Tinggi Negeri Non Badan Hukum dan atau Koordinator Kopertis Wilayah. Untuk maksud tersebut, bersama ini kami kirimkan daftar isian (terlampir) untuk diisi dan mohon segera dikirim melalui email ke dp2mdikti@yahoo.co.id (untuk program Penelitian), dan ppm.dp2m@ristekdikti.go.id (untuk program Pengabdian Masyarakat) paling lambat tanggal 21 Januari 2018.

Khusus untuk Perguruan Tinggi Negeri Badan Hukum, informasi lebih lanjut mengenai kontrak akan diberitahukan lebih lanjut melalui Lembaga Penelitian dan Pengabdian kepada Masyarakat masing-masing. Hal-hal lain yang terkait dengan mekanisme penyaluran dana dan pelaksanaan pendanaan akan diinformasikan kemudian melalui laman: http://simlibtamas.ristekdikti.go.id

Atas perhatian dan kerjasama Saudara, kami ucapkan terima kasih.

Direktur Riset dan Pengabdian Masyarakat

ttd

Ocky Karna Radjasa
NIP 196510291990031001

Tembusan.
1. Dirjen Penguatan Riset dan Pengembangan
2. Ketua LP/LPPM/LPM Perguruan Tinggi
3. Sekretaris Pelaksana Kopertis Wilayah I s/d XIV

Lampiran Surat Nomor : 0045/E3/LL/2018

Tanggal : 16 Januari 2018

Tentang : PENERIMAAN PENDANAAN PENELITIAN DAN PENGABDIAN MASYARAKAT DI PERGURUAN TINGGI TAHUN 2018

DAFTAR NON PTN BH

NO	PTN/ KOPERTIS	INSTITUSI	SKEMA	NAMA	JUDUL	STATUS USULAN
1	PTN	Institut Seni Budaya Indonesia Bandung	P3S	ENDAH IRAWAN	EKSPERIMEN ANGKLUNG PENTATONIK MELALUI PEMBUATAN ALAT DAN KARYA MUSIK UNTUK MENUNJANG INDUSTRI KREATIF DI KABUPATEN BANDUNG JAWA BARAT	Lanjutan
2	PTN	Institut Seni Budaya Indonesia Bandung	P3S	MOHAMAD YUSUF WIRADIREDJA	PENCIPTAAN MUSIK DAN LAGU SUNDA ISLAMI BERDASARKAN NASKAH PEPELING KARYA ABAH ANOM SURYALAYA DALAM BENTUK KAWIH DAN TEMBANG	Baru
3	PTN	Institut Seni Budaya Indonesia Bandung	PBK	EEN HERDIANI	SEJARAH TARI TOPENG CIREBON DALAM KEMASAN MULTIMEDIA	Lanjutan
4	PTN	Institut Seni Budaya Indonesia Bandung	PBK	NENENG YANTI KHOZANATU L	SISTEM PEWARISAN SENI TRADISI DAN POLITIK IDENTITAS MELALUI PENDIDIKAN, FESTIVAL SENI, DAN PASANGGIRI DI JAWA BARAT	Baru
5	PTN	Institut Seni Budaya Indonesia Bandung	PDD	IMAM SETYOBUDI	Revitalisasi Tradisi Ngalokat Sirah Cai Irung-irung melalui Seni Kejadian di Desa Cihideung (Parongpong, Bandung Barat, Jawa Barat): Telaah Gerakan Sosial Baru Alain Touraine	Baru
6	PTN	Institut Seni Budaya Indonesia Bandung	PDP	DYAH NURHAYATI	KAJIAN ESTETIKA APLIKASI AKSARA JAWA “HANACARAKA” PADA MEDIA KOMUNIKASI VISUAL MODERN	Baru
7	PTN	Institut Seni Budaya Indonesia Bandung	PDP	SAVITRI	Transformasi Bentuk dan Fungsi Produk Tradisional Sunda sebagai Elemen Dekoratif pada Interior Kontemporer	Baru
8	PTN	Institut Seni Budaya Indonesia Bandung	PDP	WURI HANDAYANI	Pedagogi Estetik Berbasis Kearifan Lokal melalui Batik Cianjur bagi Remaja di Kabupaten Cianjur	Baru
9	PTN	Institut Seni Budaya Indonesia Bandung	PDUPT	AFRI WITA	Artikulasi Circuit of Culture Sebagai Perangkat Pengetahuan Literasi Tradisi	Lanjutan
10	PTN	Institut Seni Budaya Indonesia Bandung	PSNI	CAHYA	Naskah Sunda Kuno sebagai Sumber Inspirasi Visualisasi Estetik dalam Bentuk Seni Pertunjukan	Lanjutan
11	PTN	Institut Seni Budaya Indonesia Bandung	PSNI	ENOK WARTIKA	PENGEMASAN MODEL KOMUNIKASI BERBASIS MULTIMEDIA DALAM BERKONTRIBUSI MENGOPTIMALKAN PROGRAM KONSERVASI DAN REVITALISASI SENI BUDAYA LOKAL INDONESIA DI JAWA BARAT	Baru
12	PTN	Institut Seni Budaya Indonesia Bandung	PSNI	JAENI	REVITALISASI BUDAYA LOKAL6 (ENAM) KABUPATEN/KOTA JAWA BARAT DALAM BENTUK SENI PERTUNJUKAN UNTUK PENGEMBANGAN WISATA DAN PEMBERDAYAAN EKONOMI MASYARAKAT	Baru
13	PTN	Institut Seni Budaya Indonesia Bandung	PSNI	SUHARNO	KURASI FASHION: Model Bingkai Kurasi pada Jember Fashion Carnival	Lanjutan
14	PTN	Institut Seni Budaya Indonesia Bandung	PSNI	YANTI HERIYAWATI	Pengembangan Kearifan Lokal Budaya Maritim Nusantara melalui Festival Pesisir Utara dan Selatan Jawa Barat	Baru
15	PTN	Institut Seni Budaya Indonesia Bandung	PTUPT	YADI MULYADI	INOVASI MUSIK LONGSER TEATER DAERAH JAWA BARAT DENGAN DIGITALISASI GAMELAN	Baru

NO	PTN/ KOPERTIS	INSTITUSI	SKEMA	NAMA	JUDUL	STATUS USULAN
11.199	KOPERTIS VII	Universitas Kristen Petra	PDUPT	ROLLY INTAN	Pengembangan Konsep dan Teori Dynamic Sets Serta Korelasinya dengan Fuzzy Sets, Rough Sets dan Multisets	Baru
11.200	KOPERTIS VII	Universitas Kristen Petra	PDUPT	RONALD HASUDUNGAN I SITINDJAK	IKONOGRAFI RUMAH TRADISIONAL DI INDONESIA	Baru
11.201	KOPERTIS VII	Universitas Kristen Petra	PDUPT	SERLI WIJAYA	MODEL PENGALAMAN DESTINASI DAN NIAT BERPERILAKU WISATAWAN: KAJIAN WISATA KULINER INDONESIA	Baru
11.202	KOPERTIS VII	Universitas Kristen Petra	PDUPT	YUSITA KUSUMARINI	Model Pembelajaran Sustainable Design Dengan Metode Service Learning Sebagai Upaya Meminimalkan Celah Teori Dan Praktik	Baru
11.203	KOPERTIS VII	Universitas Kristen Petra	PDUPT	ZEPLIN JIWA HUSADA TARIGAN	Pengaruh kompetensi manajemen menentukan tim proyek untuk desain proses implementasi proyek ERP guna meningkatkan kinerja bisnis.	Baru
11.204	KOPERTIS VII	Universitas Kristen Petra	PKLN	I GEDE AGUS WIDYADANA	Optimal inventory deteriorating item models by considering with pricing, transportation and unavailabOptimal inventory deteriorating item models by considering with pricing, transportation and unavailability production and supplyility production and supply	Baru
11.205	KOPERTIS VII	Universitas Kristen Petra	PKLN	JULIANA ANGGONO	Modified Sugarcane Bagasse: Their Chemistry, Structure-Property Relationship to Improve Strength of Biocomposites	Baru
11.206	KOPERTIS VII	Universitas Kristen Petra	PSNI	AGUSTINUS NOERTJAHYANA	IMPLEMENTASI PRIVATE CLOUD DI LABORATORIUM KOMPUTER UNTUK PENINGKATAN UTILITAS SUMBER DAYA KOMPUTER	Lanjutan
11.207	KOPERTIS VII	Universitas Kristen Petra	PSNI	ANDREAS HANDOJO	PENGEMBANGAN APLIKASI MUSEUM INDONESIA BERBASIS ANDROID SEBAGAI DAYA TARIK WISATA DAN SARANA PEMBELAJARAN	Lanjutan
11.208	KOPERTIS VII	Universitas Kristen Petra	PSNI	ANTONI	Pengembangan Beton Ringan sebagai Produk Modular Outdoor Furniture	Lanjutan
11.209	KOPERTIS VII	Universitas Kristen Petra	PSNI	DANIEL ROHI	Evaluasi Pemanfaatan dan Pemetaan Potensi Sumber Daya Air untuk Pembangkit Energi Listrik Di Daerah Aliran Sungai (DAS) Brantas Jawa Timur	Lanjutan
11.210	KOPERTIS VII	Universitas Kristen Petra	PSNI	DJONI HARYADI SETIABUDI	SISTEM INFORMASI TERINTEGRASI LOGISTIK BANTUAN KEMANUSIAAN UNTUK BENCANA ALAM	Lanjutan
11.211	KOPERTIS VII	Universitas Kristen Petra	PSNI	HANDRY KHOSWANTO	Sistem Pembelajaran Manipulator Lengan Robot Berbasis Teknologi Informasi	Lanjutan
11.212	KOPERTIS VII	Universitas Kristen Petra	PSNI	HERI SAPTONO WARPINDYASMO RO	PENGEMBANGAN BENDA APUNG UNTUK KONVERSI ENERGI GELOMBANG LAUT	Lanjutan
11.213	KOPERTIS VII	Universitas Kristen Petra	PSNI	I NYOMAN SUTAPA	PERANCANGAN SISTEM PENGUKURAN KINERJA BERBASIS BALANCED-SCORECARD UNTUK MENINGKATKAN EFEKTIVITAS SISTEM MANAJEMEN MUTU PERGURUAN TINGGI	Lanjutan
11.214	KOPERTIS VII	Universitas Kristen Petra	PSNI	LEO WILLYANTO SANTOSO	RANCANG BANGUN DAN EVALUASI APLIKASI BUSINESS INTELLIGENCE (CASE STUDY: INDUSTRI DI SEKTOR PENDIDIKAN DAN RETAIL)	Lanjutan
11.215	KOPERTIS VII	Universitas Kristen Petra	PSNI	MURTIYANTO SANTOSO	Pengembangan Sistem Layanan Informasi Prediksi Pasar Modal Berbasis Artificial Intelligence	Lanjutan
11.216	KOPERTIS VII	Universitas Kristen Petra	PSNI	NJO ANASTASIA	BIAS PERILAKU INVESTOR PROPERTI DALAM KEPUTUSAN INVESTASI DI PASAR REAL ESTAT INDONESIA	Lanjutan
11.217	KOPERTIS VII	Universitas Kristen Petra	PSNI	SIANA HALIM	DESAIN FASILITAS PERPUSTAKAAN BERDASARKAN KEBUTUHAN Generasi DIGITAL NATIVE	Lanjutan
11.218	KOPERTIS VII	Universitas Kristen Petra	PSNI	SILVIA ROSTIANINGSIH	PEMODELAN 3D UNSUR KIMIA DENGAN AUGMENTED REALITY	Lanjutan
11.219	KOPERTIS VII	Universitas Kristen Petra	PTUPT	FELIX PASILA	IMPLEMENTASI GAME SIMULATOR BERBASIS NEURO-FUZZY	Baru
11.220	KOPERTIS VII	Universitas Kristen Petra	PTUPT	GAN SHU SAN	Kajian Implementasi Remanufaktur Produk Bersiklus Hidup Pendek di Indonesia	Lanjutan

KEMENTERIAN RISET, TEKNOLOGI DAN PENDIDIKAN TINGGI
KOORDINASI PERGURUAN TINGGI SWASTA
WILAYAH VII
Jl. Dr. Ir. H. Soekarno No. 177 Surabaya 60117
Telp. (031) 5925418, 5925419, 5947473 Fax. (031) 5947479
Laman *www.kopertis7.go.id* email : *info@kopertis7.go.id*

KONTRAK PENELITIAN TAHUN ANGGARAN 2018

ANTARA
KOORDINATOR KOPERTIS WILAYAH VII
DENGAN
REKTOR UNIVERSITAS KRISTEN PETRA

Nomor: 002 /SP2H/LT/K7/KM/2018

Pada hari ini Senin tanggal dua puluh enam bulan Februari tahun dua ribu delapan belas, kami yang bertandatangan dibawah ini :

1. **Prof. Dr. Ir. Suprapto, DEA.** : Koordinator Kopertis Wilayah VII Kementerian Riset, Teknologi dan Pendidikan Tinggi yang berkedudukan di Surabaya berdasarkan Surat Keputusan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor A4/KP/2014 tanggal 18 September 2014 untuk selanjutnya disebut **PIHAK PERTAMA**;

2. **Prof. Dr. Ir. Djwantoro Hardjito, M.Eng.** : **Rektor Universitas Kristen Petra** yang berkedudukan di Surabaya dalam hal ini bertindak untuk dan atas nama Perguruan Tinggi tersebut untuk selanjutnya disebut **PIHAK KEDUA**.

PIHAK PERTAMA dan **PIHAK KEDUA** secara bersama-sama bersepakat mengikatkan diri dalam suatu Kontrak Pendanaan Penelitian di Perguruan Tinggi Tahun 2018, dengan ketentuan dan syarat sebagai berikut:

PASAL 1

Kontrak Penelitian ini berdasarkan kepada:

1. Undang-Undang Republik Indonesia Nomor 17 Tahun 2003, tentang Keuangan Negara;
2. Undang-Undang Republik Indonesia Nomor 20 Tahun 2003, tentang Sistem Pendidikan Nasional;
3. Undang-Undang Republik Indonesia Nomor 01 Tahun 2004, tentang Perbendaharaan Negara;
4. Undang-Undang Republik Indonesia Nomor 15 Tahun 2004, tentang Pemeriksaan Pengelolaan dan Tanggung Jawab Keuangan Negara;
5. Undang-Undang Republik Indonesia Nomor 12 Tahun 2012 tentang Pendidikan Tinggi
6. Undang-undang Nomor 39 Tahun 2008 tentang Kementerian Negara;
7. Peraturan Presiden Nomor 7 Tahun 2015 tentang Organisasi Kementerian Negara;
8. Peraturan Presiden Nomor 13 Tahun 2015 tentang Kementerian Riset, Teknologi, dan Pendidikan Tinggi;
9. Peraturan Menteri Keuangan Nomor 86/PMK.02/2017 tentang Standar Biaya Keluaran Tahun 2018;
10. Peraturan Menteri Riset,Tekologi dan Pendidikan tinggi Republik Indonesia Nomor 15 Tahun 2015, tentang Organisasi dan Tata Kerja Kementerian Riset,Tekologi dan Pendidikan tinggi;
11. Peraturan Menteri Riset, Teknologi dan Pendidikan Tinggi Republik Indonesia Nomor 69 tahun 2016 tentang Tata Cara Pembentukan Komite Penilaian dan/atau Reviewer Penelitian;

12. Peraturan Direktur Jenderal Perbendaharaan Kementerian Keungan Republik Indonesia Nomor 15/PB/2017 tentang Petunjuk Pelaksaaan Pembayaran Anggaraan Penelitian Berbasis Standar Biaya Keluaran Sub Keluaran Penelitian;
13. Keputusan Menteri Riset, Teknologi dan Pendidikan Tinggi Republik Indonesia Nomor 425/M/KPT/2017 tentang Pejabat Perbendaharaan Pada Direktorat Jenderal Penguatan Riset dan Pengembangan Tahun Anggaran 2018;
14. Keputusan Direktur Jenderal Penguatan Riset dan Pengembangan Kementerian Riset, Teknologi dan Perguruan Tinggi Republik Indonesia Nomor 3/E/KPT/2018 tentang Penerima Pendanaan Penelitian di Perguruan Tinggi Tahun Anggaran 2018;
15. Keputusan Kuasa Pengguna Anggaran Direktorat Jenderal Penguatan Riset dan Pengembangan Kementerian Riset, Teknologi, dan Pendidikan Tinggi Nomor 02/E.1/KPT/2017 tanggal 2 Januari 2018 tentang Pejabat Perbendaharaan Direktorat Jenderal Penguatan Riset dan Pengembangan Kementerian Riset, Teknologi dan Perguruan Tinggi Republik Indonesia;
16. Surat Edaran Direktur Riset dan Pengabdian Kepada Masyarakat Nomor 0045/E3/LL/2018 tanggal 16 Januari 2018 tentang Penerima Pendanaan Penelitian dan Pengabdian Masyarakat di Perguruan Tinggi Tahun 2018;
17. Kontrak Penelitian Tahun Anggaran 2018 antara Pejabat Pembuat Komitmen Direktorat Riset dan Pengabdian Kepada Masyarakat Nomor 120/SP2H/LT/DRPM/2018 tanggal 30 Januari 2018.

PASAL 2

(1) **PIHAK PERTAMA** memberi tugas kepada **PIHAK KEDUA**, dan **PIHAK KEDUA** menerima tugas tersebut untuk mengkoordinir dan sebagai penanggungjawab Kontrak Penelitian yang dilakukan oleh para peneliti di **Universitas Kristen Petra**

(2) **PIHAK KEDUA** bertanggungjawab penuh atas pelaksanaan, administrasi dan keuangan atas pekerjaan sebagaimana dimaksud pada ayat (1).

(3) Kontrak sebagaimana dimaksud ada ayat (1) sebanyak **37** Judul Penelitian dibebankan pada DIPA (Daftar Isian Pelaksanaan Anggaran) Nomor SP DIPA-042.06.1.401516/2018 tanggal 5 Desember 2017.

(4) Daftar nama Ketua Peneliti, judul, Luaran Tambahan dan besarnya biaya setiap judul penelitian yang telah disetujui untuk didanai tercantum dalam Lampiran yang merupakan bagian yang tidak terpisahkan dari Kontrak Penelitian ini.

PASAL 3

(1) **PIHAK PERTAMA** memberikan pendanaan penelitian sebagaimana dimaksud dalam Pasal 2 sebesar **Rp3.773.552.000 (tiga milyar tujuh ratus tujuh puluh tiga juta lima ratus lima puluh dua ribu rupiah)** yang dibebankan kepada DIPA Direktorat Jenderal Penguatan Riset dan Pengembangan Kementerian Riset, Teknologi dan Pendidikan Tinggi Nomor SP DIPA-042.06.1.401516/2018 tanggal 5 Desember 2017.

(2) Pendanaan Pelaksanaan Penelitian sebagaimana dimaksud pada ayat (1) dibayarkan oleh **PIHAK PERTAMA** kepada **PIHAK KEDUA** secara sekaligus dan/atau bertahap dari Bendahara Pengeluaran Kopertis Wilayah VII kepada rekening Institusi melalui mekanisme transfer rekening, dengan ketentuan sebagai berikut:
   a) Pembayaran Tahap Pertama sebesar ***Rp2.641.486.400 (dua milyar enam ratus empat puluh satu juta empat ratus delapan puluh enam ribu empat ratus rupiah),***
   b) Pembayaran Tahap Kedua/Terakhir sebesar ***Rp1.132.065.600 (satu milyar seratus tiga puluh dua juta enam puluh lima ribu enam ratus rupiah),***
   c) Pembayaran biaya luaran tambahan sebesar ***Rp135.000.000 (seratus tiga puluh lima juta rupiah)***
   d) **PIHAK KEDUA** bertanggungjawab mutlak dalam penggunaan dana tersebut pada ayat (1) sesuai dengan proposal kegiatan yang telah disetujui.

(3) Pembayaran pada Skema Penelitian Dosen Pemula, Penelitian Disertasi Doktor dan Penelitian Pendidikan Magister menuju Doktor untuk Sarjana Unggul dilaksanakan secara sekaligus (100%) diawal bersamaan dengan Pembayaran Tahap Pertama skema yang lainya.

(4) Pembayaran pada Skema Penelitian Berbasis Kompetensi, Penelitian Kerjasama Luar Negeri, Penelitian Penciptaan dan Penyajian Seni, Penelitian Strategis Nasional, Penelitian Unggulan Strategis Nasional, Penelitian Dasar Unggulan Perguruan Tinggi, Penelitian Terapan Unggulan Perguruan Tinggi, Penelitian

Pengembangan Unggulan Perguruan Tinggi, Penelitian Kerjasama Antar Perguruan Tinggi, Penelitian Tim Pascasarjana dan Penelitian Pasca Doktor dibayarkan secara bertahap sebesar 70% dan 30%.

(5) Pembayaran Tahap Pertama diberikan apabila **PIHAK KEDUA** telah melengkapi proposal penelitian yang memuat judul penelitian, pendekatan dan metode penelitian yang digunakan, data yang akan diperoleh, anggaran yang akan digunakan, dan tujuan penelitian berupa luaran yang akan dicapai.

(6) **PIHAK KEDUA** memantau pengunggahan ke laman **SIMLITABMAS** dokumen sebagai berikut:
   a. Catatan harian pelaksanaan penelitian
   b. Laporan kemajuan pelaksanaan penelitian
   c. Surat Pernyataan Tanggungjawab Belanja (SPTB) atas dana penelitian yang telah ditetapkan

(7) Pembayaran Tahap Kedua diberikan kepada PIHAK KEDUA, setelah menggunggah dokumen sebagaimana dimaksud pada ayat (6) huruf b dan huruf c ke laman SIMLITABMAS paling lambat 14 September 2018.

(8) Biaya tambahan dibayarkan kepada **PIHAK KEDUA** bersamaan dengan pembayaran Tahap Kedua dengan melampirkan Daftar luaran penelitian yang sudah di validasi oleh **PIHAK PERTAMA**.

PASAL 4

(1) Pendanaan Kontrak Penelitian sebagaimana dimaksud Pasal 2 ayat (1) dibayarkan kepada Institusi sebagai berikut.

Nama Institusi	:	**Universitas Kristen Petra**
Nomor Rekening	:	**1116655508**
Nama penerima pada rekening	:	**LPPM Universitas Kristen Petra**
Nama Bank	:	**BNI'46**
Alamat Bank	:	**Jl. Ahmad Yani No. 286, Lt. 1 & 2 Gedung Graha Pangeran**
Kota	:	**Surabaya**
NPWP Perguruan Tinggi	:	**01.312.288-2.631.001**

(2) **PIHAK PERTAMA** tidak bertanggungjawab atas keterlambatan dan/atau tidak terbayarnya sejumlah dana sebagaimana dimaksud pada Pasal 3, yang disebabkan oleh kesalahan **PIHAK KEDUA** dalam menyampaikan informasi sebagaimana dimaksud pada ayat (1).

PASAL 5

(1) **PIHAK KEDUA** berkewajiban untuk menindak lanjuti dan mengupayakan pelaksanaan Penelitian yang dilakukan dosen untuk memperoleh luaran wajib untuk setiap judul proposal Penelitian sebagaimana dimaksud pada Pasal 2 ayat (1).

(2) Perolehan sebagaimana dimaksud pada ayat (1) dimanfaatkan sebesar-besarnya untuk pelaksanaan Tridharma Perguruan Tinggi.

(3) **PIHAK KEDUA** berkewajiban untuk melaporkan perkembangan perolehan luaran wajib sebagaimana dimaksud pada ayat (1) secara berkala kepada **PIHAK PERTAMA**,yaitu pada setiap akhir Tahun Anggaran berjalan.

PASAL 6

(1) **PIHAK KEDUA** berkewajiban untuk membuat Surat sub Kontrak Penelitian antara Pimpinan Perguruan Tinggi dengan Ketua Peneliti di Perguruan Tinggi masing-masing. Selanjutnya Kontrak Penelitian antara Pimpinan Perguruan Tinggi Ketua Pelaksana Penelitian mengatur hak dan kewajiban setiap pelaksana di lingkungan perguruan tingginya yang memuat antara lain: nama pelaksana, judul Program Penelitian, jumlah dana hibah, tata cara dan termin pembayaran, waktu pelaksanaan, batas akhir pelaporan, pencantuman pemberi dana penelitian dalam publikasi ilmiah, luaran penelitian dan sanksi;

(2) Penilaian **kemajuan** pelaksanaan Penelitian sebagaimana dimaksud pada ayat (1) dilakukan oleh **PIHAK KEDUA**, setelah ketua pelaksana mengunggah laporan kemajuan pelaksanaan kegiatan ke laman (*website*) SIMLITABMAS, dengan berpedoman kepada prinsip dan/atau kaidah Program Penelitian;

(3) Perubahan terhadap susunan tim pelaksana dan substansi pelaksanaan Penelitian dapat dibenarkan apabila telah mendapat persetujuan dari Direktur Riset dan Pengabdian Masyarakat Direktorat Jenderal Penguatan Riset dan Pengembangan.

PASAL 7

(1) **PIHAK KEDUA** harus menyelesaikan seluruh pekerjaan yang dibuktikan dengan pengunggahan pada laman (*website*) SIMLITABMAS.
   a. Catatan harian dan laporan komprehensif pelaksanaan Penelitian, pada tanggal 16 November 2018
   b. Laporan akhir, capaian hasil, Poster, artikel ilmiah dan profile, pada tanggal 16 November 2018 (bagi penelitian tahun terakhir).

(2) Apabila sampai dengan batas waktu yang telah ditetapkan untuk melaksanakan Kontrak Pendanaan Penelitian di Perguruan Tinggi Tahun 2018 telah berakhir, **PIHAK KEDUA** belum menyelesaikan tugasnya dan atau terlambat mengirim laporan Kemajuan dan atau terlambat mengirim laporan akhir, maka **PIHAK KEDUA** dikenakan sanksi administratif berupa penghentian pembayaran dan tidak dapat mengajukan proposal penelitian dalam kurun waktu dua tahun berturut-turut.

(3) Peneliti/Pelaksana Penelitian yang tidak hadir dalam kegiatan Pemonitoran dan Evaluasi tanpa pemberitahuan sebelumnya kepada Direktur Riset dan Pengabdian Masyarakat, maka Pelaksanan Penelitian tidak berhak menerima sisa dana tahap kedua.

(4) Apabila dalam penilaian luaran terdapat luaran tambahan yang tidak tercapai maka dana tambahan yang sudah diterima harus disetorkan kembali ke kas negara

PASAL 8

(1) Laporan hasil Penelitian sebagaimana tersebut pada Pasal 7 ayat (1) ditulis dalam format font Times New Romans ukuran 12 spasi 1,5 kertas A4 pada bagian bawah sampul (*cover*) ditulis :

Dibiayai oleh:
Direktorat Riset dan Pengabdian Masyarakat
Direktorat Jenderal Penguatan Riset dan Pengembangan
Kementerian Riset, Teknologi, dan Pendidikan Tinggi
sesuai dengan Kontrak Penelitian Tahun Anggaran 2018

(2) *Softcopy* laporan hasil program penelitian sebagaimana tersebut pada ayat (1) harus diunggah ke laman (*website*) SIMLITABMAS, *hardcopy* asli harus disimpan oleh **PIHAK KEDUA.**

PASAL 9

(1) Apabila **PIHAK KEDUA** berhenti dari jabatannya, sebelum Kontrak Penelitian ini selesai, maka **PIHAK KEDUA** wajib menyerah terimakan tanggung jawabnya kepada pejabat baru yang menggantikannya, dibuktikan dengan adanya Berita Acara Serah Terima (BAST) yang ditandatangi oleh kedua belah pihak.

(2) Apabila setiap Ketua Pelaksana sebagaimana dimaksud dalam Pasal 2 ayat (4) tidak dapat menyelesaikan pelaksanaan Penelitian ini, maka **PIHAK KEDUA** wajib menunjuk pengganti Ketua Pelaksana yang merupakan salah satu anggota tim setelah mendapat persetujuan tertulis dari Direktur Riset dan Pengabdian Masyarakat Direktorat Jenderal Penguatan Riset dan Pengembangan.

(3) Apabila setiap ketua Peneiliti mengundurkan diri sebagai ketua harus diganti dengan anggota tim syarat ketentuan yang ada, jika tidak ada dana kembalikan ke Kas Negara.

(4) PASAL 10

PIHAK KEDUA berkewajiban memungut dan menyetor pajak ke kantor pelayanan pajak setempat yang berkenaan dengan kewajiban pajak berupa:

1. pembelian barang dan jasa dikenai PPN sebesar 10% dan PPh 22 sebesar 1,5%;
2. pajak–pajak lain sesuai ketentuan.

PASAL 11

(1) Hak Kekayaan Intelektual yang dihasilkan dari Pelaksanaan Penelitian diatur dan dikelola sesuai dengan peraturan dan perundang-undangan.

(2) Setiap publikasi, makalah dan/atau ekspos dalam bentuk apapun yang berkaitan dengan hasil penelitian ini wajib mencantumkan **PIHAK PERTAMA** sebagai pemberi dana.

(3) Hasil Penelitian berupa peralatan dan/atau peralatan yang dibeli dari kegiatan ini adalah milik negara, dan dapat dihibahkan kepada institusi/lembaga melalui Berita Acara Serah Terima (BAST).

(4) Apabila terdapat hal-hal lain yang belum diatur dalam Kontrak Penelitian ini dan memerlukan pengaturan, maka akan diatur kemudian oleh **PARA PIHAK** melalui amandemen Kontrak Penelitian ini dan/atau melalui pembuatan perjanjian tersendiri yang merupakan bagian tidak terpisahkan dari Kontrak Penelitian ini

PASAL 12

(1) **PARA PIHAK** dibebaskan dari tanggung jawab atas keterlambatan atau kegagalan dalam memenuhi kewajiban yang dimaksud dalam Kontrak Penelitian disebabkan atau diakibatkan oleh peristiwa atau kejadian diluar kekuasaan **PARA PIHAK** yang dapat digolongkan sebagai keadaan memaksa (*force majeure*).

(2) Peristiwa atau kejadian yang dapat digolongkan keadaan memaksa (*force majeure*) dalam Kontrak Penelitian ini adalah bencana alam, wabah penyakit, kebakaran, perang, blokade, peledakan, sabotase, revolusi, pemberontakan, huru-hara, serta adanya tindakan pemerintah dalam bidang ekonomi dan moneter yang secara nyata berpengaruh terhadap pelaksanaan Kontrak Penelitian ini.

(3) Apabila terjadi keadaan memaksa (*force majeure*) maka pihak yang mengalami wajib memberitahukan kepada pihak lainnya secara tertulis, selambat-lambatnya dalam waktu 7 (tujuh) hari kerja sejak terjadinya keadaan memaksa (*force majeure*), disertai dengan bukti-bukti yang sah dari pihak yang berwajib, dan **PARA PIHAK** dengan itikad baik akan segera membicarakan penyelesaiannya.

PASAL 13

(1) Apabila terjadi perselisihan antara **PIHAK PERTAMA** dan **PIHAK KEDUA** dalam pelaksanaan Kontrak Penelitian ini akan dilakukan penyelesaian secara musyawarah dan mufakat dan apabila tidak tercapai penyelesaian secara musyawarah dan mufakat maka penyelesaian dilakukan melalui proses Hukum yang berlaku dengan memilih domisili Hukum di Pengadilan Negeri Surabaya.

(2) Hal-hal yang belum diatur dalam Kontrak Penelitian ini akan diatur kemudian oleh kedua belah pihak.

PASAL 14

Surat Perjanjian Pendanaan Penelitian di Perguruan Tinggi Tahun 2018 ini dibuat rangkap 2 (dua) bermaterai cukup sesuai dengan ketentuan yang berlaku, dan biaya materai dibebankan kepada **PIHAK KEDUA**.

PIHAK PERTAMA	**PIHAK KEDUA**
METERAI TEMPEL 9799DAEF779888884 6000 ENAM RIBU RUPIAH	
Prof. Dr. Ir. Suprapto, DEA.	**Prof. Dr. Ir. Djwantoro Hardjito, M.Eng.**
NIP 196006241987011001	

SURAT PERNYATAAN TANGGUNGJAWAB MUTLAK
BERDASARKAN KONTRAK PENELITIAN

Yang bertanda tangan di bawah ini :

Nama	:	Prof. Dr. Ir. Djwantoro Hardjito, M.Eng.
Jabatan	:	Rektor
Institusi	:	Universitas Kristen Petra
No. SP2H	:	002 /SP2H/LT/K7/KM/2017
Jumlah Judul	:	37 Judul
Jumlah Dana	:	Rp. Rp3.773.552.000 ,- (tiga milyar tujuh ratus tujuh puluh tiga juta lima ratus lima puluh dua ribu rupiah)

Menyatakan dengan sesungguhnya bahwa :

1. Bertanggungjawab mutlak dalam pembelanjaan dana Kontrak Penelitian dan berkewajiban menyimpan semua bukti-bukti pengeluaran sesuai dengan jumlah dana yang diberikan;
2. Berkewajiban mengembalikan sisa dana yang tidak dibelanjakan ke kas Negara;
3. Bertanggungjawab penuh atas data administrasi pelaksana/penerima dana Kontrak Penelitian;
4. Berkewajiban untuk menindaklanjuti dan mengupayakan hasil Kontrak Penelitian yang dilakukan agar terlaksana dengan efektif dan efisien;
5. Berkewajiban untuk menyimpan hardcopy dan softcopy Laporan Kemajuan dan Laporan Akhir Kontrak Penelitian.

Surabaya, 26 Februari 2018

Rektor

METERAI TEMPEL 78EEEAEF779988879 6000 ENAM RIBU RUPIAH

Prof. Dr. Ir. Djwantoro Hardjito, M.Eng.

KEMENTERIAN RISET, TEKNOLOGI DAN PENDIDIKAN TINGGI
KOORDINASI PERGURUAN TINGGI SWASTA
WILAYAH VII
Jl. Dr. Ir. H. Soekarno No. 177 Surabaya 60117
Telp. (031) 5925418, 5925419, 5947473 Fax. (031) 5947479
Laman www.kopertis7.go.id Email : *info@kopertis7.go.id*

RISTEKDIKTI

Tahun Anggaran	:	2018
Nomor Bukti	:	
Mata Anggaran	:	

KUITANSI

Sudah terima dari	:	Pejabat Pembuat Komitmen Kopertis Wilayah VII
Uang sebesar (dengan huruf)	:	**dua milyar enam ratus empat puluh satu juta empat ratus delapan puluh enam ribu empat ratus rupiah**
Untuk pembayaran	:	Dana Kontrak Penelitian Tahap I (satu) SP2H Nomor 002 /SP2H/LT/K7/KM/2018, tanggal 26 Februari 2018

Rp2.641.486.400

Pejabat Pembuat Komitmen
Kopertis Wilayah VII,

KEMENTERIAN RISET, TEKNOLOGI, DAN PENDIDIKAN TINGGI
KOORDINASI PERGURUAN TINGGI SWASTA WILAYAH VII

Dr. Widyo Winarso, M.Pd.
NIP. 196203141991031002

Surabaya,
Rektor

UNIVERSITAS KRISTEN PETRA

Prof. Dr. Ir. Djwantoro Hardjito, M.Eng.

KEMENTERIAN RISET, TEKNOLOGI DAN PENDIDIKAN TINGGI
KOORDINASI PERGURUAN TINGGI SWASTA
WILAYAH VII
Jl. Dr. Ir. H. Soekarno No. 177 Surabaya 60117
Telp. (031) 5925418, 5925419, 5947473 Fax. (031) 5947479
Laman www.kopertis7.go.id Email : *info@kopertis7.go.id*

Tahun Anggaran	:	2018
Nomor Bukti	:	
Mata Anggaran	:	

KUITANSI

Sudah terima dari	:	Pejabat Pembuat Komitmen Kopertis Wilayah VII
Uang sebesar (dengan huruf)	:	**satu milyar seratus tiga puluh dua juta enam puluh lima ribu enam ratus rupiah**
Untuk pembayaran	:	Dana Kontrak Penelitian Tahap II (dua) SP2H Nomor 002 /SP2H/LT/K7/KM/2018, tanggal 26 Februari 2018

Rp1.132.065.600

Pejabat Pembuat Komitmen
Kopertis Wilayah VII,

Dr. Widyo Winarso, M.Pd.
NIP. 196203141991031002

Surabaya,
Rektor

Prof. Dr. Ir. Djwantoro Hardjito, M.Eng.

Lampiran Kontrak Penugasan Penelitian dan Pengabdian Kepada Masyarakat Tahun Angaran 2018

Nama & Kode PT	Total Dana		Pencairan Tahap I		Pencairan Tahap II		Dana Tambahan	
071002	**Rp**	**3.773.552.000**	**Rp**	**2.641.486.400**	**Rp**	**1.132.065.600**	**Rp**	**135.000.000**
Universitas Kristen Petra	**Rp**	**3.773.552.000**	**Rp**	**2.641.486.400**	**Rp**	**1.132.065.600**	**Rp**	**135.000.000**
Penelitian	Rp	3.773.552.000	Rp	2.641.486.400	Rp	1.132.065.600	Rp	135.000.000
AGUSTINUS NOERTJAHYANA	Rp	130.000.000	Rp	91.000.000	Rp	39.000.000	Rp	15.000.000
ANDREAS HANDOJO	Rp	120.000.000	Rp	84.000.000	Rp	36.000.000	Rp	-
ANTONI	Rp	174.550.000	Rp	122.185.000	Rp	52.365.000	Rp	-
CHRISTINA EVIUTAMI MEDIASTIKA	Rp	107.500.000	Rp	75.250.000	Rp	32.250.000	Rp	-
DANIEL ROHI	Rp	125.000.000	Rp	87.500.000	Rp	37.500.000	Rp	15.000.000
DJONI HARYADI SETIABUDI	Rp	140.000.000	Rp	98.000.000	Rp	42.000.000	Rp	-
DODDY PRAYOGO	Rp	64.365.000	Rp	45.055.500	Rp	19.309.500	Rp	-
FELIX PASILA	Rp	184.925.000	Rp	129.447.500	Rp	55.477.500	Rp	-
GAN SHU SAN	Rp	130.000.000	Rp	91.000.000	Rp	39.000.000	Rp	-
GATUT PRIYOWIDODO	Rp	161.146.000	Rp	112.802.200	Rp	48.343.800	Rp	-
HANDRY KHOSWANTO	Rp	140.000.000	Rp	98.000.000	Rp	42.000.000	Rp	-
HATANE SEMUEL	Rp	100.000.000	Rp	70.000.000	Rp	30.000.000	Rp	15.000.000
HERI SAPTONO WARPINDYASMORO	Rp	120.000.000	Rp	84.000.000	Rp	36.000.000	Rp	-
I GEDE AGUS WIDYADANA	Rp	80.000.000	Rp	56.000.000	Rp	24.000.000	Rp	-
I NYOMAN SUTAPA	Rp	120.000.000	Rp	84.000.000	Rp	36.000.000	Rp	-
IDO PRIJANA HADI	Rp	67.792.000	Rp	47.454.400	Rp	20.337.600	Rp	-
IWAN HANDOYO PUTRO	Rp	59.500.000	Rp	41.650.000	Rp	17.850.000	Rp	-
JONI DEWANTO	Rp	67.256.000	Rp	47.079.200	Rp	20.176.800	Rp	-
JULIANA ANGGONO	Rp	130.000.000	Rp	91.000.000	Rp	39.000.000	Rp	-
LAKSMI KUSUMA WARDANI	Rp	90.000.000	Rp	63.000.000	Rp	27.000.000	Rp	-
LEO WILLYANTO SANTOSO	Rp	120.000.000	Rp	84.000.000	Rp	36.000.000	Rp	15.000.000
MURTIYANTO SANTOSO	Rp	110.000.000	Rp	77.000.000	Rp	33.000.000	Rp	-
NJO ANASTASIA	Rp	70.000.000	Rp	49.000.000	Rp	21.000.000	Rp	15.000.000
RESMANA	Rp	230.000.000	Rp	161.000.000	Rp	69.000.000	Rp	15.000.000
ROLLY INTAN	Rp	64.838.000	Rp	45.386.600	Rp	19.451.400	Rp	-
RONALD HASUDUNGAN I SITINDJAK	Rp	80.500.000	Rp	56.350.000	Rp	24.150.000	Rp	-
SERLI WIJAYA	Rp	72.100.000	Rp	50.470.000	Rp	21.630.000	Rp	-
SETEFANUS SUPRAJITNO	Rp	115.000.000	Rp	80.500.000	Rp	34.500.000	Rp	-
SIANA HALIM	Rp	70.000.000	Rp	49.000.000	Rp	21.000.000	Rp	15.000.000
SILVIA ROSTIANINGSIH	Rp	130.000.000	Rp	91.000.000	Rp	39.000.000	Rp	15.000.000
SURYA HERMAWAN	Rp	150.000.000	Rp	105.000.000	Rp	45.000.000	Rp	-
YULIA	Rp	120.000.000	Rp	84.000.000	Rp	36.000.000	Rp	15.000.000
YUSITA KUSUMARINI	Rp	70.000.000	Rp	49.000.000	Rp	21.000.000	Rp	-
ZEPLIN JIWA HUSADA TARIGAN	Rp	59.080.000	Rp	41.356.000	Rp	17.724.000	Rp	-

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SURAT PERJANJIAN PENUGASAN PELAKSANAAN HIBAH
Penelitian Dasar
Tahun Anggaran 2018

Nomor : 037/SP2H/LT/PD/LPPM-UKP/III/2018

Pada hari ini Kamis tanggal satu bulan Maret tahun dua ribu delapan belas, kami yang bertandatangan dibawah ini:

1. **Dr. Drs. RIBUT BASUKI, M.A.** : Kepala Lembaga Penelitian dan Pengabdian kepada Masyarakat Universitas Kristen Petra, bertindak atas nama Rektor Universitas Kristen Petra yang selanjutnya dalam Surat Perjanjian ini disebut sebagai **PIHAK PERTAMA**;

2. **Dr. JULIANA ANGGONO, S.T., M.Sc.** : Dosen Universitas Kristen Petra dalam hal ini bertindak sebagai pengusul dan Ketua Pelaksana Penelitian Dasar Tahun Anggaran 2018 untuk selanjutnya disebut **PIHAK KEDUA**.

Perjanjian penugasan ini berdasarkan pada Surat Penugasan Pelaksanaan Hibah Penelitian bagi dosen Perguruan Tinggi Swasta Kopertis Wilayah VII Tahun Anggaran 2018, Nomor: **002/SP2H/LT/K7/KM/2017**, tanggal **26 Februari 2018**

PIHAK PERTAMA dan **PIHAK KEDUA**, secara bersama-sama bersepakat mengikatkan diri dalam suatu Perjanjian Pelaksanaan Penugasan Program Hibah Penelitian Dasar Tahun Anggaran 2018, dengan ketentuan dan syarat-syarat sebagaimana diatur dalam pasal-pasal sebagai berikut:

Pasal 1
Penugasan Penelitian

(1) **PIHAK PERTAMA** memberi tugas kepada **PIHAK KEDUA**, dan **PIHAK KEDUA** menerima tugas tersebut untuk melaksanakan Penelitian Program Penelitian Dasar tahun 2018 dengan judul "MODIFIED SUGARCANE BAGASSE: THEIR CHEMISTRY, STRUCTURE- PROPERTY RELATIONSHIP TO IMPROVE STRENGTH OF BIOCOMPOSITES".

(2) **PIHAK KEDUA** bertanggung jawab penuh atas pelaksanaan administrasi dan keuangan atas pekerjaan sebagai mana dimaksud pada ayat 1 dan berkewajiban menyerahkan semua bukti-bukti pengeluaran serta dokumen pelaksanaan lainnya dalam bendel laporan yang tersusun secara sistematis kepada **PIHAK PERTAMA**.

(3) Pelaksanaan Penugasan Penelitian Dasar tahun 2018 sebagaimana dimaksud judul penelitian di atas didanai dari DIPA Direktorat Jenderal Penguatan Riset dan Pengembangan Nomor SP DIPA-042.06.1.401516/2018 tanggal 5 Desember 2017.

Pasal 2
Tim Penelitian

Susunan Tim penelitian:

1) Peneliti Utama : Dr. JULIANA ANGGONO, S.T., M.Sc.
2) Anggota Peneliti : ANTONI, S.T., M.Eng., Ph.D.
   HARIYATI PURWANINGSIH, S.Si., M.Si.

Pasal 3
Beban Tugas

PIHAK PERTAMA memberikan beban tugas 4 SKS kepada peneliti dengan pembagian: Ketua Peneliti (2 SKS), Anggota Peneliti 1 (1 SKS), Anggota Peneliti 2 (1 SKS), dan untuk 2 (dua) semester yang diatur oleh Program Studi masing-masing peneliti.

Pasal 4
Biaya Penelitian dan Cara Pembayaran

(1) **PIHAK PERTAMA** menyerahkan dana penelitian sebagaimana dimaksud dalam pasal 1 sebesar **Rp. 130.000.000 (seratus tiga puluh juta rupiah)** yang berasal dari SP DIPA Direktorat Jenderal Penguatan Riset dan Pengembangan Nomor SP DIPA-042.06.1.401516/2018 tanggal 5 Desember 2017.

(2) Dana Penugasan Pelaksanaan sebagaimana dimaksud pada ayat (1) dibayarkan oleh **PIHAK PERTAMA** kepada **PIHAK KEDUA** secara bertahap dengan ketentuan sebagai berikut:
   a. Pembayaran Tahap Pertama sebesar 70% dari total bantuan dana kegiatan yaitu 70% X **Rp. 130.000.000 = Rp. 91.000.000 (sembilan puluh satu juta rupiah)**.
   b. Pembayaran Tahap Kedua sebesar 30% dari total dana yaitu 30% X **Rp. 130.000.000 = Rp. 39.000.000 (tiga puluh sembilan juta rupiah),** dibayarkan setelah **PIHAK KEDUA** menyerahkan *hardcopy* Laporan Kemajuan Pelaksanaan Penugasan Penelitian Dasar Tahun Anggaran 2018 dan Laporan Penggunaan Anggaran 70% yang telah dilaksanakan kepada **PIHAK PERTAMA** dan mengunggah *soft copy*nya ke simlitabmas.ristekdikti.go.id paling lambat tanggal 31 Juli 2018.
   c. **PIHAK KEDUA** bertanggungjawab mutlak dalam pembelanjaan dana tersebut pada ayat (1) sesuai dengan proposal kegiatan yang telah disetujui dan berkewajiban untuk menyerahkan kepada **PIHAK PERTAMA** semua bukti-bukti pengeluaran sesuai dengan jumlah dana yang diberikan oleh **PIHAK PERTAMA**.
   d. **PIHAK KEDUA** berkewajiban mengembalikan sisa dana yang tidak dibelanjakan kepada **PIHAK PERTAMA** untuk disetor ke Kas Negara.
   e. Dana Penugasan sebagaimana dimaksud dalam Pasal 1 ayat 3 dibayarkan kepada **PIHAK KEDUA** melalui rekening yang diajukan dan atas nama **PIHAK KEDUA**.

Pasal 5
Jangka waktu penelitian

Jangka waktu penelitian terhitung bulan **1 Maret 2018** sampai dengan tanggal **31 Oktober 2018**.

Pasal 6
Publikasi dan Kekayaan Intelektual (KI)

(1) **PIHAK KEDUA** berkewajiban menindaklanjuti dan mengupayakan hasil Program Hibah Penelitian berupa kekayaan intelektual dan atau publikasi ilmiah sesuai dengan luaran yang diwajibkan dan dijanjikan pada Proposal.
(2) Perolehan hasil sebagaimana dimaksud pada ayat (1) dimanfaatkan sebesar-besarnya untuk pelaksanaan Tri Dharma Perguruan Tinggi.
(3) **PIHAK KEDUA** berkewajiban untuk melaporkan perkembangan perolehan hasil sebagaimana dimaksud pada ayat (1) kepada **PIHAK PERTAMA** selambat-lambatnya pada tanggal **3 September 2018**.

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Homepage Internet : http://www.petra.ac.id/

Pasal 7
Monev Internal dan Eksternal

(1) **PIHAK KEDUA** berkewajiban mengunggah laporan kemajuan pelaksanaan kegiatan ke simlitabmas.ristekdikti.go.id paling lambat tanggal **31 Juli 2018** sesuai ketentuan pada Panduan Penelitian dan Pengabdian kepada Masyarakat Edisi XII tahun 2018.
(2) **PIHAK PERTAMA** melakukan Monitoring dan Evaluasi internal terhadap kemajuan pelaksanaan Program Hibah Penelitian tahun 2018 sebelum pelaksanaan monitoring dan evaluasi eksternal oleh Direktorat Jenderal Penguatan Riset dan Pengembangan.

Pasal 8
Kewajiban Ketua Peneliti

Ketua Peneliti wajib hadir pada:
a. Monitoring dan Evaluasi Internal dan Eksternal;
b. Seminar Hasil Penelitian yang diadakan oleh Lembaga Penelitian dan Pengabdian kepada Masyarakat (LPPM) Universitas Kristen Petra dan/atau Direktorat Jenderal Penguatan Riset dan Pengembangan, Kementerian Riset, Teknologi dan Pendidikan Tinggi.
c. Bersama dengan tim memenuhi luaran yang diwajibkan dan dijanjikan sesuai dengan skema yang diusulkan.

Pasal 9
Pergantian Tim Peneliti

(1) Perubahan terhadap susunan tim pelaksana dan substansi pelaksanaan Program Hibah Penelitian dapat dibenarkan apabila telah mendapat persetujuan tertulis dari Direktur Riset dan Pengabdian Masyarakat, Direktorat Jenderal Penguatan Riset dan Pengembangan, Kementerian Riset, Teknologi, dan Pendidikan Tinggi.
(2) Apabila **PIHAK KEDUA** selaku ketua pelaksana sebagaimana dimaksud pada Pasal 1 tidak dapat melaksanakan Program Hibah Penelitian Tahun 2018, maka **PIHAK KEDUA** wajib mengusulkan pengganti ketua pelaksana yang merupakan salah satu anggota tim kepada **PIHAK PERTAMA**.
(3) Apabila **PIHAK KEDUA** tidak dapat melaksanakan tugas dan tidak ada pengganti ketua sebagaimana dimaksud dalam Pasal 1 maka **PIHAK KEDUA** harus mengembalikan dana kepada **PIHAK PERTAMA** yang selanjutnya disetor ke Kas Negara.
(4) Bukti setor sebagaimana dimaksud pada ayat (2) disimpan oleh **PIHAK PERTAMA.**

Pasal 10
Laporan Penelitian

(1) **PIHAK KEDUA** berkewajiban mengunggah Laporan Akhir pelaksanaan Penugasan Program Hibah Penelitian Tahun 2018 sesuai ketentuan pada Panduan Penelitian dan Pengabdian kepada Masyarakat Edisi XII tahun 2018 dan mengisi Rekapitulasi Laporan Penggunaan Anggaran 100% pada simlitabmas.ristekdikti.go.id **paling lambat tanggal 31 Oktober 2018**.
(2) Hard copy Laporan Akhir dan Rekapitulasi Laporan Penggunaan Anggaran sebagaimana dimaksud ayat (1) diserahkan kepada **PIHAK PERTAMA** paling lambat tanggal **31 Oktober 2018.**
(3) Laporan Akhir sebagaimana dimaksud ayat (2) harus memenuhi ketentuan sebagai berikut:
   a. Bentuk/ukuran kertas A4;
   b. Warna sampul/cover sesuai dengan skema;
   c. Di bawah bagian sampul/cover ditulis:

ZA

UNIVERSITAS KRISTEN PETRA

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Direktorat Riset dan Pengabdian Masyarakat
Direktorat Jenderal Penguatan Riset dan Pengembangan
Kementerian Riset, Teknologi, dan Pendidikan Tinggi
Nomor: 120/SP2H/LT/DRPM/2018 tanggal 30 Januari 2018

Pasal 11
Sanksi

(1) Apabila sampai dengan batas waktu yang telah ditetapkan untuk melaksanakan Hibah Penelitian telah berakhir, **PIHAK KEDUA** belum menyelesaikan tugasnya dan atau terlambat mengunggah laporan Kemajuan dan atau terlambat mengunggah laporan akhir, maka **PIHAK KEDUA** dikenakan sanksi denda sebesar 1‰ (satu permil) setiap hari keterlambatan sampai dengan setinggi-tingginya 5% (lima persen), terhitung dari tanggal jatuh tempo sebagaimana tersebut pada pasal 5 Surat Perjanjian Pelaksanaan Hibah Program Penelitian Dasar Tahun Anggaran 2018;
(2) Denda sebagaimana dimaksud pada ayat (2) disetorkan ke Kas Negara dan foto copy bukti setor denda yang telah divalidasi oleh KPPN setempat diserahkan kepada **PIHAK PERTAMA.**

Pasal 12
Keaslian Penelitian dan Ketidakterikatan dengan Pihak Lain

(1) Apabila dikemudian hari judul Penelitian Dasar sebagaimana dimaksud pada Pasal 1 ditemukan adanya duplikasi dengan Hibah Penelitian lain dan/atau ditemukan adanya ketidak jujuran/itikad kurang baik yang tidak sesuai dengan kaidah ilmiah, maka kegiatan Program Hibah Penelitian tersebut dinyatakan batal dan **PIHAK KEDUA** wajib mengembalikan dana Hibah Program Penelitian Dasar Tahun 2018 yang telah diterima kepada **PIHAK PERTAMA** yang selanjutnya disetor ke Kas Negara.
(2) Bukti setor sebagaimana dimaksud pada ayat (1) disimpan oleh kepada **PIHAK PERTAMA.**

Pasal 13
Pajak

Hal-hal dan atau segala sesuatu yang berkenaan dengan kewajiban pajak berupa PPN dan/atau PPh menjadi tanggungjawab **PIHAK KEDUA** dan harus dibayarkan ke kantor pelayanan pajak setempat sebagai berikut:
1. Pembelian barang dan jasa dikenai PPN sebesar 10% dan PPh 22 sebesar 1,5%;
2. Belanja honorarium dikenai PPh Pasal 21 dengan ketentuan:
   5% bagi yang memiliki NPWP untuk golongan III dan IV, serta 6% bagi yang tidak memiliki NPWP.
3. Pajak-pajak lain sesuai ketentuan yang berlaku.

Pasal 14
Hak Kepemilikan

(1) Hak atas kekayaan intelektual yang dihasilkan dari pelaksanaan Program Hibah Penelitian diatur dan dikelola sesuai dengan peraturan dan perundang-undangan yang berlaku.
(2) Hasil Program Hibah Penelitian berupa peralatan dan/atau alat yang dibeli dari kegiatan ini adalah milik Negara yang dapat dihibahkan kepada institusi/lembaga/masyarakat melalui Surat Keterangan Hibah.

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Pasal 15
Perselisihan

(1) Apabila terjadi perselisihan antara **PIHAK PERTAMA** dan **PIHAK KEDUA** dalam pelaksanaan perjanjian ini akan dilakukan penyelesaian secara musyawarah dan mufakat, dan apabila tidak tercapai penyelesaian secara musyawarah dan mufakat maka penyelesaian dilakukan melalui proses hukum.

(2) Hal-hal yang belum diatur dalam perjanjian ini diatur kemudian oleh kedua belah pihak.

Pasal 16
Penutup

Surat Perjanjian Penugasan Pelaksanaan Program Hibah Penelitian ini dibuat rangkap 2 (dua) dan bermaterai cukup sesuai dengan ketentuan yang berlaku.

PIHAK PERTAMA	**PIHAK KEDUA**
METERAI TEMPEL F81B3AEF779888876 6000 ENAM RIBU RUPIAH	
Dr. Drs. RIBUT BASUKI, M.A.	**Dr. JULIANA ANGGONO, S.T., M.Sc.**
NIDN. 0719076501	NIDN. 0718056801

LAPORAN AKHIR TAHUN

PENELITIAN DASAR

Nomor: 037/SP2H/LT/PD/LPPM-UKP/III/2018

MODIFIED SUGARCANE BAGASSE: THEIR CHEMISTRY, STRUCTURE-PROPERTY RELATIONSHIP TO IMPROVE STRENGTH OF BIOCOMPOSITES

Tahun ke-1 dari rencana 2 tahun

Dr. Juliana Anggono, ST., MSc.	NIDN. 0718056801
Antoni, S.T., M. Eng., Ph.D.	NIDN. 0721067601
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Prof. Béla Pukánszky	
Dr. János Móczó	

Universitas Kristen Petra

NOVEMBER 2018

Dibiayai oleh:
Direktorat Riset dan Pengabdian Masyarakat
Direktorat Jenderal Penguatan Riset dan Pengembangan
Kementerian Riset, Teknologi, dan Pendidikan Tinggi
Nomor: 002/SP2H/LT/K7/KM/2018 tanggal 30 Januari 2018

HALAMAN PENGESAHAN

Judul	: Modified Sugarcane Bagasse: Their Chemistry, Structure-Property Relationship to Improve Strength of Biocomposites
Peneliti/Pelaksana	
Nama Lengkap	: Dr JULIANA ANGGONO, S.T, M.Sc.
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Nama Institusi Mitra	: Budapest University of Technology and Economics
Alamat	: H-1521 Budapest, PO Box 91
Penanggung Jawab	: Prof. Dr. Bela Pukanszky dan Dr. Janos Moczo
Tahun Pelaksanaan	: Tahun ke 1 dari rencana 2 tahun
Biaya Tahun Berjalan	: Rp 130,000,000
Biaya Keseluruhan	: Rp 291,750,000

Mengetahui, Vice Rector for Academic Affairs	Kota Surabaya, 5 - 11 - 2018 Ketua,
(Dr. Dra. JENNY MOCHTAR, M.A.) NIP/NIK 86-012	(Dr JULIANA ANGGONO, S.T, M.Sc.) NIP/NIK 94-016

Menyetujui,
LPPM - Head

(Dr. Drs. RIBUT BASUKI, M.A.)
NIP/NIK 92-019

SUMMARY

Sugarcane is an important crop for production of sugar and the world's largest crop grown in about 23.8 million hectares in more than 90 countries with a worldwide harvest of about 1.69 billion tonnes in 2010. Indonesia is rank 9^{th} as major producers of sugarw cane after Brazil, India, China (mainlands), Thailand, Pakistan, Mexico, Colombia, Philippines with a production of 28.7 million tonnes in 2012. The sugar production results in large amounts of bagasse which is about 30-32% of the total cane weight. It consists of fibres (48% including ash), water (50% moisture), and relatively small amount of soluble solids (2%)- mostly sugar. Bagasse fibers is the fibrous residue which are obtained from milled sugarcane stalks that are harvested from grass family plant named *saccharum officinarum*. [http://www.fao.org/docrep/003/s8850e/s8850e03.htm (2015)**]** The fibre as similar with other lignocellulosic materials consists mainly of cellulose (42.3%), pentosans (25.1%), lignin (24.7%), acetyl groups (3.7%), and ash (3.5%).**[** Rocha, *et al.* (2012)**]**

Relatively fewer studies have investigated the modification on lignocellulosic fibers obtained from sugarcane baggase. Moreover, the studies done were reported less about quantification the changes in the composition of the most important components (waxs, lignin, hemicellulose, and cellulose) of the bagasse fibers. Alkali treatment can change the crystalline structure of cellulose as well. This treatment affects the strength of the bagasse fibers, and this is the reason why it is difficult to explain the results of the mechanical test of the composites. Previous research work focused on the study of structural and morphological modification on bagasse fibers pretreated using sodium hydroxide (NaOH) 10% v/v in different time length of pretreatment ranging from 2 to 6 hours at 60-70^{o}C.

Properties of the composites depends on four factors (properties of the components, their chemistry/chemical composition, structure, interfacial interactions between fiber-matrix). The treatment changes at least two factors: properties of the fibers and interfacial interactions between fiber and the matrix. Based on our previous study, the alkali treatment resulted in an improvement in the composite properties, however the composite strength can be further improved.On the other hand, fiber properties (strength, deformability) can also change after the treatment. This first year work aims to investigate the effects of treatment (solution concentration, solution type, as well as treatment/soaking time) on the mechanical properties of polymer/treated sugarcane bagasse through a systematic experimental work on factors which affect the efficiency of the bagasse fiber modification through alkali treatment.

Sodium hydroxide treatment on the bagasse at various concentrations, i.e. 1, 2, 8, 10, 15, 20, 30, 40 wt.% NaOH have been carried out. There were two kinds of bagasse that received the treatment; they were the long bagasse obtained from a sugarcane juice staller and short bagasse supplied by local sugar mill. The chemical analysis has been performed using Van Soest method which lignin, hemicellulose, and cellulose were determined. Ash and water content were also obtained. The lowest lignin content of the treated bagasse was resulted from treatment with 15 wt.% NaOH. A maximum was observed in the strength of the fibers as a function of NaOH concentration, which probably explains the beneficial effect of such treatment on composite properties.

PREFACE

Eight months of this first year research work has been completely done as planned. There has been a strong commitment and good communication between the Indonesian team with the Hungarian partner. The first year work has been fully done and the results were reported here and have written into a paper draft. A second paper on the preliminary study of the planned second year research work about deformation mechanism of sugarcane/PP biocomposite has been presented at the 4th International Conference on Bio-based Polymers and Composites (BiPoCo) on 2-6 September 2018 in Balatonfured, Hungary. That paper has also been submitted to a high reputable European Polymer Journal and waiting for a review process. Within this research scheme, a three-week research visit to Budapest University of Technology and Economics took place as planned on 13 August to 2 September 2018. Meanwhile Prof. Béla Pukánszky (Budapest University of Technology and Economics) visited Petra Christian University for a scientific talk and discussion happened at 19-28 September 2018. The research work has been agreed to continue in second year with preparing biocomposites samples using an optimum NaOH treatment condition that gives the strongest sugarcane fibers, i.e. 8 wt.% NaOH at room temperature for one hour.

Table of Contents

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS

Department of Physical Chemistry and Material Science
Laboratory of Plastics and Rubber Technology

Budapest, October 17, 2018

Dear Professor Gyarmati,

Please find enclosed the manuscript " DEFORMATION AND FAILURE OF SUGARCANE BAGASSE REINFORCED PP " by Juliana Anggono et al. for your kind consideration to be reviewed and published in European Polymer Journal. The paper deals with biocomposites derived from agricultural waste. Structure - property correlations, as well as deformation and failure characteristics of PP/sugarcane bagasse composites were investigated.

Hereby we confirm that the manuscript or its contents in some other form, has not been published previously by any of the authors and/or is not under consideration for publication in another journal at the time of submission and all the authors have seen and approved the submission of the manuscript.

I thank you for your consideration and send you my best regards.

Yours sincerely
János Móczó

✉ H-1521 Budapest, Műegyetem rkp. 3. H/I. ☎ Tel: (36-1) 382-6569 Fax: (36-1) 463-3474
E-mail: jmoczo@mail.bme.hu

RINGKASAN PRAKATA DAFTAR ISI DAFTAR TABEL DAFTAR GAMBAR DAFTAR LAMPIRAN BAB 1. PENDAHULUAN BAB 2. TINJAUAN PUSTAKA BAB 3. TUJUAN DAN MANFAAT PENELITIAN

BAB 4. METODE PENELITIAN

BAB 5. HASIL DAN LUARAN YANG DICAPAI BAB 6. RENCANA TAHAPAN BERIKUTNYA BAB 7. KESIMPULAN DAN SARAN DAFTAR PUSTAKA LAMPIRAN (bukti luaran yang didapatkan)

- Artikel ilmiah (draft, status submission

atau reprint), dll.

- HKI, publikasi dan produk penelitian lainnya

CHAPTER 1. INTRODUCTION

1.1. Research Background

In the past decade, lightweight materials made from natural fibers composites with thermoplastics and thermosets have been embraced by automakers and suppliers to achieve weight reduction in order to improve fuel economy of automobiles and reduction of greenhouse gas emission. In the United States (US), there is a legislation and regulations in the form of Corporate Average Fuel Economy (CAFE) standards to improve the average fuel economy of cars and light trucks (trucks, vans, and sport utility vehicles) produced for sale in the US.

In 2025, CAFE standards is targeted to be 54.5 mpg (miles/gallon), an increase of 54% from current nominal standards (35.5 mpg) in 2016**.** [Pilla and Lu (2015); U.S. Environmental Protection Agency, Office of Transportation and Air Quality (2012)] Therefore auto manufacturers selling in the US must meet the CAFE standards enforced by the National Highway Traffic Safety Administration (NHTSA). One of the pathways for automotive industry to achieve CAFE standards for 2025 is to renew their focus on lightweight materials to achieve weight reduction. This can be achieved in structural and nonstructural components such as door panels, seatbacks, headliners, package trays, dash boards, front-end, and interior parts. The usage of lightweight, low cost natural fibers such as kenaf, jute, sisal, hemp, and flax are providing automobile makers benefits of reduction in CO_2, less dependence of oil sources, recyclability, and they are renewable and sustainable resources. The automotive industries around the globe are continuously optimizing cost versus quality in order to remain competitive in the market. Moreover, increased social awareness of environmental problems is forcing automobile manufacturers to look for renewable resources for raw materials and recyclability or biodegradability of the product at the end of its useful life. This enhances the use of agro-based biofibers as biodegrable content in automotive applications. [Bledzki, *et al.* (2006)] Bio-fibers reinforced plastic composites are used in various applications in nearly all the major car manufacturers in Germany (Mercedes, Daimler Chrysler, Audi Group, Volkswagen, BMW, Ford and Opel). Figure 1.1 shows green composites products used in Mercedes car. **[**http://www.mercedes-benz.com.br (2008)**]** Polypropylene and natural fibers are used to produce for interior trim components such as dashboards and door panels for Daimler Chrysler. Door trim panels made of polyurethane reinforced with mixed flax/sisal was used in Audi A2 midrange car in 2000. **[**Automotive Industries, DaimlerChrysler ‘‘Goes Natural’’ for Large Body Panel (2000)**]**

FIGURE 1.1. Automotive parts that use *green composites* (Mercedes Benz) **[**http://www.mercedes-benz.com.br (2008)**]**

The end of life vehicle (ELV) directive in Europe states that by 2015, vehicles must be constructed of 95% recyclable materials, with 85% recoverable through reuse or mechanical recycling and 10% through energy recovery or thermal recycling. **[**Peijs (2003)**]** Natural fibers used for manucfacturing components in the automotive sector are non-wood fibers, such as flax, kenaf, hemp, jute, and sisal. Research done by a team at Baylor University led by Prof. Walter Bradley has used coir from the outer husks of coconuts to make trunk liners, floorboards, and car-door interior to replace poyester fibers that commonly used in the automotive application.**[**http://www.livescience.com/3180-car-parts-coconuts.html (2015)**]** Using similar approach of finding natural fibers for biocomposites application, in this research work, the potentials of sugarcane bagasse fibers which are renewable resources and grow in Indonesia were studied. Bagasse fibers is the fibrous residue which are obtained from milled sugarcane stalks that are harvested from grass family plant named *saccharum officinarum*. Sugarcane is an important crop for production of sugar and the world's largest crop grown in about 23.8 million hectares in more than 90 countries with a worldwide harvest of about 1.69 billion tonnes in 2010. **[**http://www.fao.org/docrep/003/s8850e/s8850e03.htm (2015)**]** Indonesia is rank 9th as major producers of sugar cane after Brazil, India, China (mainlands), Thailand, Pakistan, Mexico, Colombia, Philippines with a production of 28.7 million tonnes in 2012. **[**http://www.fao.org/docrep/003/s8850e/s8850e03.htm (2015)**]** The sugar production results in large amounts of bagasse which is about 30-32% of the total cane weight. **[**Lee and Mariatti (2008)**]** It consists of fibres (48% including ash), water (50% moisture), and relatively small amount of soluble solids (2%)- mostly sugar. **[**http://www.fao.org/docrep/003/s8850e/s8850e03.htm (2015)**]** The fibre as similar with other lignocellulosic materials consists mainly of cellulose (42.3%), pentosans (25.1%), lignin (24.7%), acetyl groups (3.7%), and ash (3.5%). **[**Rocha, *et al.* (2012)**]**

Several research had studied bagasse as a potential resource as a reinforcement element in biocomposites. **[**Verma *et al.* (2012); Monteiro, *et al.* (1998)**;** Vazquez, *et al.* (1999); de Sausa, *et al.* (2004); Shibata, *et al.* (2005); Zheng, *et al.* (2007); da Silva, *et al.* (2009); Puls, *et al.* (2011)**]** There are a wide ray of applications in building, construction, and automobiles that exist for the fabrication of bagasse based composites. The use of lignocellulosic materials require a treatment step. To prepare and enable wide-scale acceptance and confidence of the commercial communities, a thorough and fundamental of some major technical considerations must be addressed. Some of the limitations of natural fibers as reinforcement for composites are related to the low strength properties, low interfacial adhesion between fibers surface and matrix, low moisture repellance, limited processing temperature (± 200°C), and flame-retardant properties. To overcome the limitations, various treatments can be applied to modify the fibers surface in order to improve the adhesion between fibers and matrix which can result in improvement of mechanical properties of the end products. One of the treatments is mercerization (alkali treatment). The principle of alkali treatment method is the removal of lignin (major loss) whereas cellulose and a part of the hemicelluloses remain in the solid material (minor loss of hemicellulose). Mercerization has been proven to be effective for removal of lignin in the fibers therefore enhanced fiber suface adhesion which allowed an effective stress transfer from matrix to fiber. Strong alkaline solution of NaOH is a common alkaline solution used in the treatment. However, NaOH is reactive and hazardous solution to handle. Other works have used different solution in the pretreatment stage to prepare the bagasse fibers. Cerqueira, *et al.* reported an increase of 16% in tensile strength of composite (22.3-23 MPa) compared to the strength of polypropylene when adding 5, 10, and 20% treated bagasse fibers.

Chemical pretreatments using acid have been successfully applied to sugarcane bagasse fiber. **[**Vazquez, *et al.* (1999); Zheng, *et al.* (2007); Pereira *et al.* (2011)**]** Acids hydrolyze hemicellulose and produce a liquid phase rich in xylose, with minor amounts of lignin derivatives and it has been successfully applied to sugarcane bagasse.**[**Geddes *et al*. (2010); Rocha, *et al.* (2011)**]** The solution and the treatment steps used were pretreatment using 10% H_2S solution followed by delignification with 1% NaOH solution. [Cerqueira, *et al.* (2011)] Leite *et al.* used $Ca(OH)_2$ solution to neutralize sugarcane pulp before drying, grinding, and forming the composite using phenolic resin. Highest tensile strength was found in the composite with 29% fibers with a size of 80-170 mesh.**[** Leite *et al.* (2004)**]**

Previous research work focused on the study of structural and morphological modification on bagasse fibers pretreated using sodium hydroxide (NaOH) 10% v/v in different time length of pretreatment ranging from 2 to 6 hours at 60-70^{o}C. [Anggono, *et al.* (2014), (2015), (2017)] Treatment bagasse fibers using 10 vol. % NaOH results in significant removal of lignin and hemicellulose. FTIR spectra indicated that lignin spectra at 1508 and 1233 cm^{-1} were no longer found in sugar cane fibers that were given shortest treatment time (2 hours). The disappearance of the peak 1723 cm^{-1} (the carbonyl peak, C=O stretching of the acetyl groups of hemicellulose) indicates the removal of hemicellulose from the fiber surfaces after 2 hours soaking time. The removal of substances from the fiber after treatment was supported by the weight loss data measured after treatment. Significant loss was measured in NaOH pretreated fibers (40.5%-57.75%) This high weight loss shows very little data on the amount loss of either lignin or hemicellulose experienced by bagasse.

It is known that the mechanical performance of a composite material depends strongly on the nature and orientation of the fibers and the nature of the matrix but also on the quality of adhesion between these two constituents. The interfacial strength developed between fibers and matrix depends on the efficiency of alkali treatment on the fibers. There are many factors which can influence the efficiency of the modification on natural fibers, i.e. alkali solution concentration, type of the alkali used, time of the treatment, etc.). According to our former results, the alkali treatment resulted in an improvement in the composite properties. The strength data obtained for composites with 25 wt. % treated fibers using NaOH 10% v/v are 5.54-7.73 MPa (3 cm bagasse fibers), 5.1-11.3 MPa (5 cm fibers), and 8.3-11.84 MPa (original length fibers). Meanwhile the composites with 20 wt. % bagasse fibers had data strength of 4.84-7.0 MPa (3 cm fibers), 8.51-9.7 MPa (5 cm fibers), and 8.61-10.1 MPa (original length fibers, i.e. 3-24 cm with 70% of them have a length of 12-21 cm). Loading the bagasse of original length up to 30 wt. %, the tensile strength decreased (5.6-10.22 MPa). Using scanning electron microscope (SEM) observation on the fracture surface, several feedbacks were obtained such as unhomogeneous fibers distribution related to the mixing process of bagasse fiber/PP, splitting of fibers, and the evidence of fibers pull-out. Unfortunately, we were unable to explain these results (fibers pull-out, fibers split) clearly in relation with the effect of treatment on the fibers strength which at last it affects the strength of the composite. Therefore the reason for the observed improvement is unclear and needs a further study.

1.2. Research Urgency and Rational

Relatively fewer studies have investigated the modification on lignocellulosic fibers obtained from sugarcane baggase. Moreover, the studies done were reported less about quantification the changes in the composition of the most important components (waxs, lignin, hemicellulose, and cellulose) of the bagasse fibers. Alkali treatment can change the crystalline structure of cellulose as well. This treatment affects the strength of the bagasse fibers, and this is the reason why it is difficult to explain the results of the mechanical test of the composites. Properties of the composites depends on four factors (properties of the components, their chemistry/chemical composition, structure, interfacial interactions between fiber-matrix). The treatment changes at least two factors: properties of the fibers and interfacial interactions between fiber and the matrix. On the other hand, fiber properties (strength, deformability) can also change after the treatment. This work aims to investigate the effects of treatment on the mechanical properties of polymer/treated sugarcane bagasse.

1.3. Track Record of Existing Collaborative Research and Roadmap of Collaborative Research

This collaborative research was iniated from the communication with Prof. Béla Pukánszky in March 2016 regarding previous research paper which was intended to be submitted to a reputable conference: 3rd International Coonference on Bio-based Polymers and Composites" (BiPoCo). This conference is a biennial conference, organized by Department of Physical Chemistry and Material Science, Budapest University of Technology and Economics and Institute of Materials and Environmental Chemistry, Research Centre for Natural Sciences, Hungarian Academy of Sciences in Budapest – Hungary. Prof. Béla Pukánszky was the chairman of the conference and his high expertise in interfacial phenomena in heterogeneous polymer systems as well as natural and biodegradable polymers have been a great help so far as a resource person to give feedback and critics on the current research work.

When attending the 3rd BiPoCo international conference last August 2016, the possibility of having a collaborative research on the natural fiber composites have been stated and agreed though it has not been made formally. Dr. János Móczó, a senior research fellow at the same department will be part of the team. Dr. Móczó has done a lot of research work in the area of natural fiber composites such as woodboard composites and has published many papers in the reputable journals. His valuable knowledge and Prof. Béla Pukánszky's high expertise, experience, and reputation will not only enrich the research proposed but also provide direction of the project to have a novelty for the research. Figure 1.2 shows the roadmap of this collaborative research in the next 4 years.

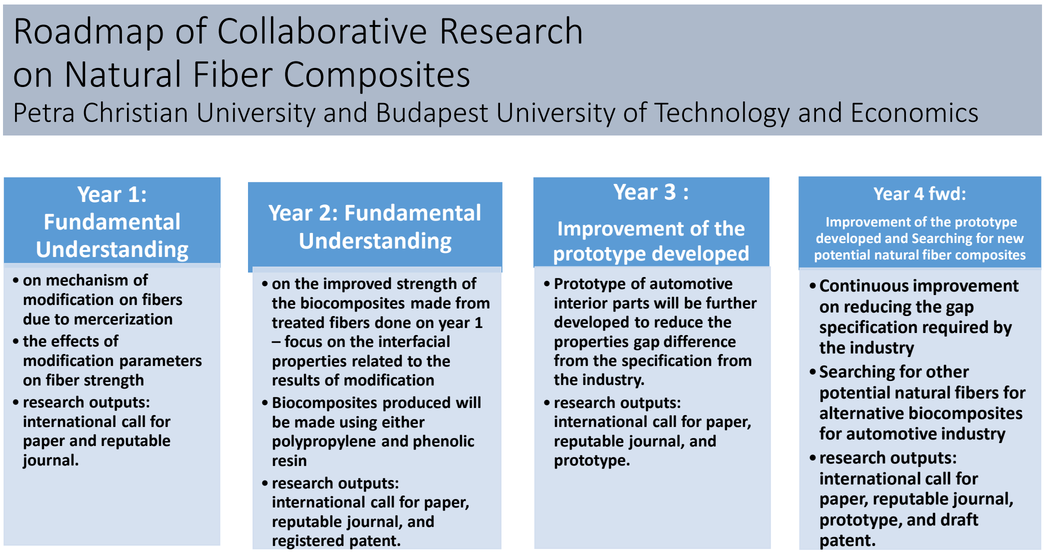


FIGURE 1.2. Collaborative research roapmap on the development of natural fiber composites between Petra Christian University and Budapest University of Technology and Economics.

Table 1.1. Research Target Plan Yearly

No	Type of Outcome				Indicator	
	Category	Sub category	Mandatory	Optional	CY	TCY+1
1.	Scientific Publication	International			accepted	accepted
		National-accredited			-	-
2.	Invited speaker in scientific forum	International			done	done
		National			-	-
3.	Keynote speaker in scientific forum	International			-	-
		National			-	-
4.	Visiting Lecturer	International			-	-
5.	Intellectual Property Right	Patent			-	-
		Simple Patent			draft	registered
		Copy Right			-	-
		Trade Mark			-	-
		Trade Secret			-	-
		Industrial Product Design			-	-
		Geographical Indication			-	-
		Plant Variety Conservation			-	-
		Integrated Circuit Topography Conservation			-	-
6.	Intermediate Technology				-	-
7.	Model/Prototype/Design/Art/ Social Engineering				-	-
8.	Book (ISBN)				-	-
9.	Technological Readiness Level (TRL)				2	3

CHAPTER 2 LITERATURE STUDY

2.1. State of the Art of This Research Work

Mercerization is an old process of cellulose fibre modification through an alkaline treatment of cellulose fibres. The process was devised in 1844 by John Mercer of Great Harwood, Lancashire, England, who treated cotton fibres with sodium hydroxide [https://en.wikipedia.org/wiki/Mercerised_cotton]. This treatment caused:

1. the fibres to swell;
2. decreasing the spiral angle of the microfibrills and increasing the molecular direction
3. fiber fibrillation, i.e., axial splitting of the elementary fibres (or microfibres) that constitute the elementary fibre [Ganan P. *et al.* (2005); Ray, D. *et al.* (2002); de Albuquerque A.C. *et al.* (2000)] → this process leads to a decrease in fibre diameter, increasing the aspect ratio and the effective surface area available for wetting by a matrix in a composite.
4. there is also an increase in fibre density as a consequence of the collapse of its cellular structure;
5. changing the fine structure of the native cellulose I to cellulose II [Okano T. and Sarko A. (1984); (1985)]. These changes may result in improvement in fibre strength and hence stronger composite materials [Ray, D. *et al.* (2002), Rodriguez E.S. *et al.* (2007), Saha *et al.* (2010)].

Although alkali treatment is an old process, the interaction of the alkaline solution used with different natural fibers from various plant species will behave differently. In other words, the interaction can be qualitatively similar but quantitatively different behavior of all the alkali hydroxides in aqueous solution from LiOH to CsOH on interaction with cellulose in an aqueous medium dependence on the concentration, soaking time, and type of alkali hydroxide used. Relatively fewer studies have investigated the modification on lignocellulosic fibers obtained from sugarcane baggase and most of the studies have not performed systematic investigation on the efficiency of the treatment. This current research work will focus on the systematic study on the bagasse fiber morphology and physical chemistry properties during degradation. This is essential for improving alkali treatment strategies and for understanding the strength improvement of fibers and their strength contribution to the composite strength.

1.2. Preliminary Results and Literature Study

1.2.1. <u>Alkali Treatment of Bagasse Fiber</u>

Previous research from Anggono, J. *el al.* (2015; 2017) reported that the treatment using alkaline solution (mercerization), i.e. NaOH 10 vol.% and $Ca(OH)_2$ 14 vol.% has been proven to be effective for removal of lignin in the fibers.

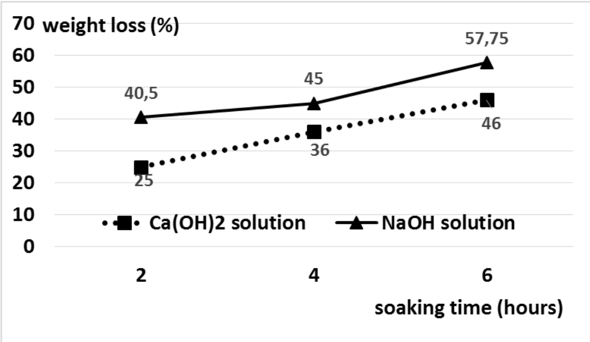


FIGURE 2.1 Weight loss of bagasse fibers after pretreatment

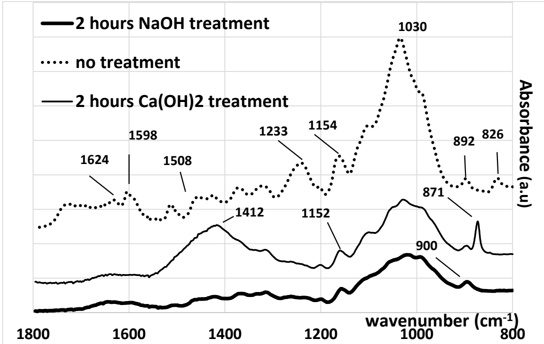


FIGURE 2.2 FTIR spectra of untreated and pretreated bagasse fibers in NaOH and $Ca(OH)_2$ 1800-800 cm^{-1}

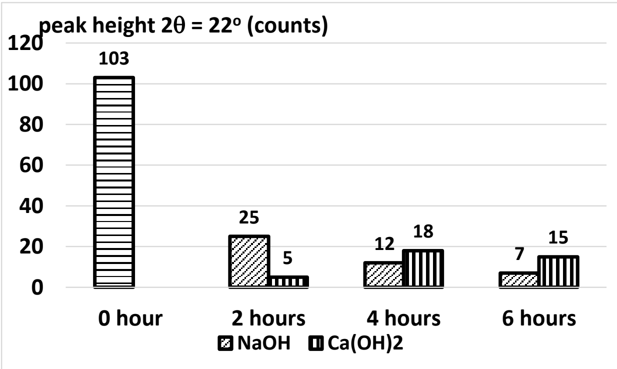


FIGURE 2.3 Quantitative data of cellulose II obtained from XRD test on bagasse fibers after pretreatment in various soaking time.

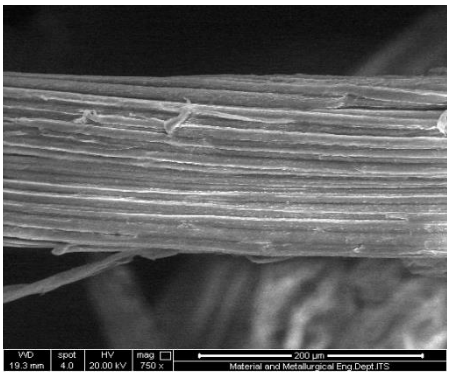


FIGURE 2.4 SEM micrographs of bagasse fibers after pretreated using NaOH for 4 hours

Bagasse fibers were prepared starting from the neutralization step before they were pretreated using sodium and calcium hydroxide for 2, 4, and 6 hours. After pretreated and oven dried, the fibers were weighed to calculate a further weight loss. Figure 2.1 shows the weight loss after both pretreatments. Significant loss was measured in NaOH pretreated fibers (40.5%-57.75%) than in the fibers pretreated using $Ca(OH)_2$ (25%-46%). Figure 2.2 shows a 1800-800 cm^{-1} region in the spectra that revealed several bands. The band at 1624 cm^{-1} is associated with adsorbed water in cellulose and probably some hemicelluloses. The obvious differences between the untreated bagasse fibers and treated fibers were noted in the range from 2000-700 cm^{-1}. Lignin spectra at 1508 and 1233 cm^{-1} were no longer found in sugarcane fibers that were given shortest pretreatment time (2 hours), either in NaOH or $Ca(OH)_2$. Other bands that are generally found in the lignin aromatic structure, i.e. at 1598 cm^{-1} and 1508 cm^{-1} which attributed to C-Ph and C=C, respectively were not identified after both pretreatments. FTIR analysis shows that after 2 hours treatment using both solutions, lignin has been removed from the fibers. The peak 1723 cm^{-1} indicates the carbonyl peak, C=O stretching of the acetyl groups of hemicellulose and can be seen in untreated fibers. The removal of hemicellulose was shown by the disappearance of carbonyl peak from the fiber surfaces after both pretreatment from 2 hours soaking time. The C-OH bending peaks at 670 cm^{-1} of cellulose are indicated in all fibers. This work of Anggono *et al.* (2015; 2017) did not study how the alkali treatment affects the strength of bagasse fibers then influence the composite strength. SEM micrograph of bagasse fiber after 2 hours NaOH treatment (Figure 2.4) shows a bundle of cellulose fibers on which surface pith was removed. The effect of the treatment on the composite strength was reported increase to the highest strength (17.58-24.92 MPa) after fibers were treated in NaOH for 6 hours. The work of Rezendel *et al.* (2011) reported a very efficient alkaline pretreatments using NaOH solutions (40 minutes) with concentration 1% where up to 85% lignin fractions were removed from the solid fraction as shown in Figure 2.5. Increasing base concentrations also removed cellulose fractions from the sample (maximum removal around 30%).

1

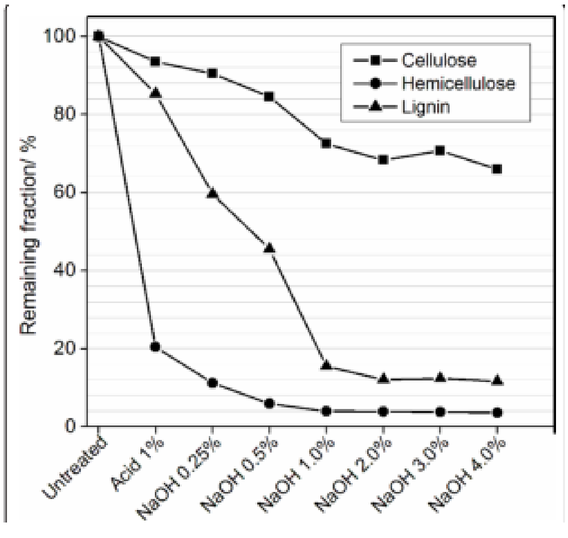


FIGURE 2.5 Remaining fractions of lignocellulosic components in bagasse samples after pretreatment steps. [Rezendel *et al.* (2011)]

Rezendel *et al.* (2011) did the work aiming to enhance enzymatic digestibility of sugarcane bagasse and the bagasse fibers were not treated to be reinforcing fibers for biocomposites. Therefore the composite strength data were not reported. Mwaikambo *et al*. (2003) investigated the effect of mercerization on the mechanical properties of hemp fibres and found that the tensile strength of hemp fibres reached the maximum (1050 MPa) when the concentration of sodium hydroxide was 6 %, and the Young modulus of hemp fibres reached maximum (65 GPa) when the concentration of sodium hydroxide was 4 %.

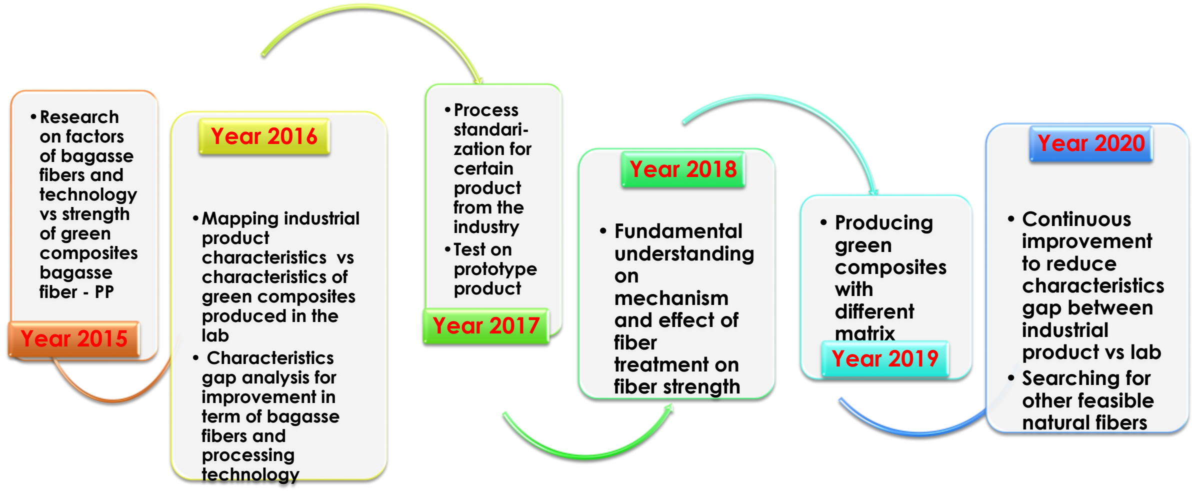


FIGURE 2.6 Five-year research roadmap on natural fibers (bagasse fiber) composites from 2015-2020

From the review of the preliminary results and other research works, it is clearly shown that the fundamental understanding on mechanism of fiber treatment using alkali solution and its effect on the fiber and composite strength has not been studied. Therefore this systematic investigation as part of the research roadmap planned for 2015-2020 (Figure 2.6) is proposed to obtain the best design of treatment process for bagasse fibers as well as their interaction with the polymeric matrix materials in order to develop better strength of composite materials.

1.2.2. Specification of Interior Automotive Part from the Industry

A local industry in West Java which supplies automotive interior parts have given the samples of the part used for package tray and we have characterized the samples. Their characteristics obtained (Table 2.1) will be used as reference to improve the biocomposites strength produced in the second year of the proposed work. Table 2.1 also includes the results from laboratory samples from previous research work granted via scheme of Penelitian Produk Terapan.

Table 2.1. Characteristics of Biocomposites Samples Obtained from Laboratory Work in Comparison with Product from Industry

Characteristics	Polypropylene	Woodboard	Biocomposite sugarcane bagasse/PP (25/75)*)
Gramasi (g/m^3)	1833	1700	1736-2291
Thickness (mm)	2.03	1.79	1.98
Tensile Strength	-	14.3	14.35
Flexural Strength (MPa)	35.6	37.6	35.39
Flexural Modulus (GPa)	1.34	2.79	1.39

CHAPTER 3. RESEARCH GOAL AND BENEFITS

3.1. Research Goal

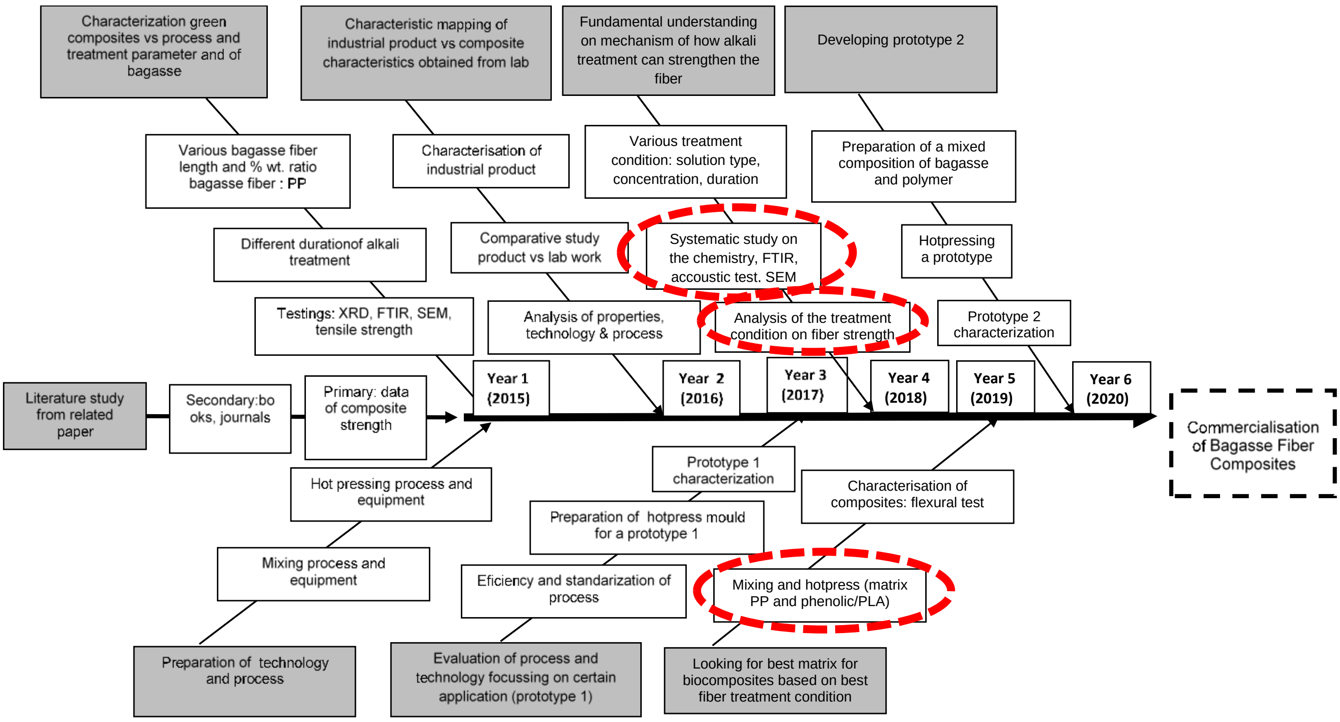
This research aims to have a further study through a systematic experimental work on factors which affect the efficiency of the bagasse fiber modification through alkali treatment. Those influential factors are solution concentration, solution type, as well as treatment/soaking time.

3.2. Research Benefits

The efficient alkali treatment that can result in increase fibers strength can lead to better interactions between fibers and the polymer matrix. Thus performance specification of a sugarcane biocomposite required by the automotive industry for an interior product can be met.

CHAPTER 4. RESEARCH METHOD

3.1. Research Stages In Fishbone Diagram



Note: ▬ ▬ ▬ ▬ These works will be done in Budapest University of Technology and Economics

FIGURE 3.1 Research stages in fishbone diagram

Continuing the current three-year research work (2015-2017) funded by Ministry of Research, Technology and Higher Education under the scheme of 'Penelitian Produk Terapan,' it is important and necessary to obtain a fundamental understanding through a further systematic study on factors which affect the efficiency of the bagasse fiber modification through alkali treatment. Those influential factors are solution concentration, solution type, as well as treatment/soaking time. Van Soest method was used to analyse the chemical content of the fibers after alkali treatment at various concentrations.

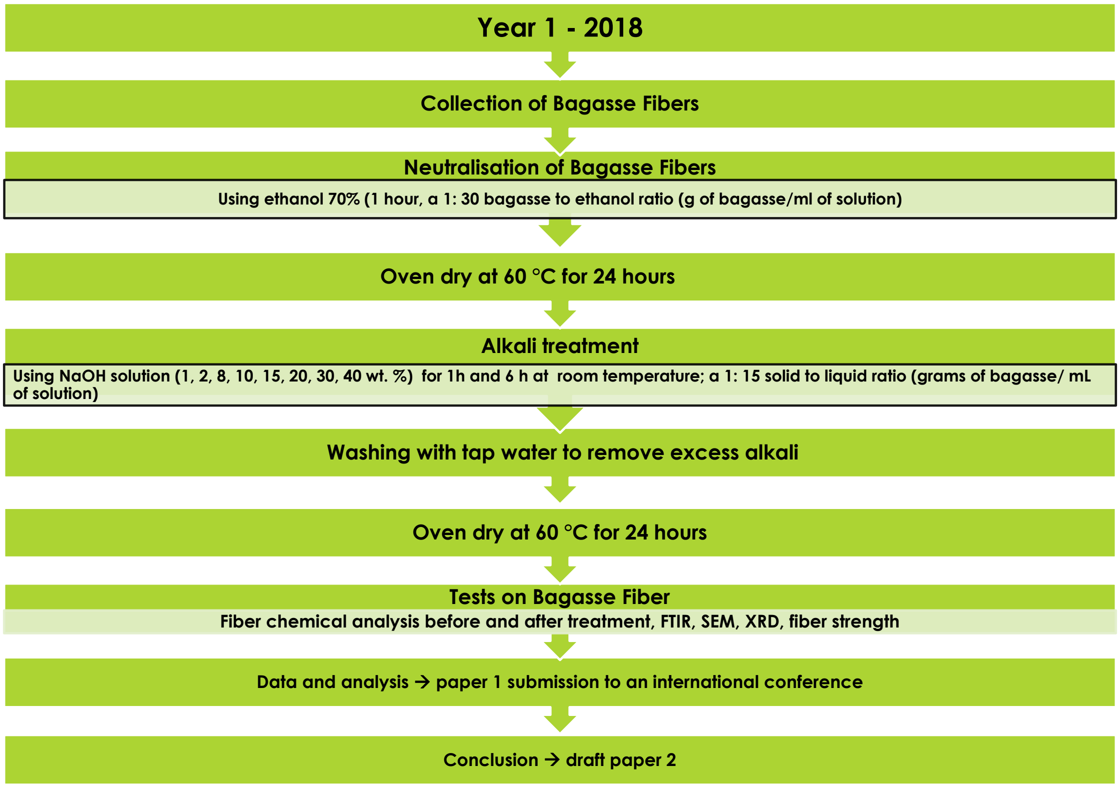


FIGURE 3.2 Research stages of year 1

3.2. Analysis of Lignocellulose Using Van Soest Method (Soest, 1967)

Bagasse samples prepared for alkali treatment were the long ones (from the juice staller) and the short ones collected from the sugar mill. Van Soest method was used for chemical analysis of the treated fibers. The characterization yielded the cellulose, hemicellulose, lignin, wax and water content of the fibers. Ash content was also determined. The steps are as follows:

1. Weigh in a crucible 1 g of dry sample (after oven dry at temperature of 60 °C) (mass X), then the sample is placed in the flask 1
2. Add 50 ml of acid detergent solution at room temperature to the flask. Then heat to boiling and reflux 60 minutes from onset of boiling
3. Filter and wash 3 times with boiling water until the foam is gone and the pH is neutral.
4. A crucible is weighed (mass Y) and also weigh the control crucible as (K1).
5. Add 30 ml cold acetone to the sample and leave it for 5 minutes, then transfer the sample into a crucible.
6. Dry the sample at 100 °C for 8 hours and let cool in a desiccator.
7. Weigh the crucible with dry sample (mass Z) and also weigh the control crucible as (K2).
8. The sample is immersed in 20 mL of 72% H2SO4 solution for 3 hours.

9. The sample is rinsed with hot water up to neutral pH, then the sample is transferred in a crucible.
10. The sample is dried in an oven at 100 ° C, then cooled in desiccator.
11. Weigh the crucible with dry sample (mass A) and also weigh the control crucible as (K3).
12. Ash in a muffle at 650 °C for 1 hour and let cool in a desiccator.
13. Weigh the crucible with sample (mass B) and also weigh the control crucible as (K4).

Calculation for chemical analysis:

- Calculation of mass Z using mass of control crucible:
    1) Calculate the dried mass after oven 8 hours (Z1) and mass of control crucible (K2)
    2) Mass difference of control crucible
       $= mass\ K1 - mass\ K2$
    3) Mass (Z) is obtained
       = mass Z1 – mass Y – mass difference of control crucible

- Calculation of mass A using mass of control crucible:
    1) Calculate the dried mass after oven 2 hours (A1) and mass difference of control crucible (K3)
    2) Mass difference of control crucible
       = mass K1 − mass K3
    4) Mass (A) is obtained
       = mass A1 – mass Y – mass difference of control crucible

  1) Calculation of mass A using mass of control crucible:
     1) Calculate the dried mass after oven (B1) and mass difference of control crucible (K4)
     2) Mass difference of control crucible
        1) 1 − mass K4
        2) massa (B)
        3) = massa B1 – massa Y – selisih massa cawan kontrol

- Celullose content (wt. %) $= \frac{\text{mass Z} - \text{mass A}}{\text{mass X}} \text{ x } 100\%$
- Lignin content (wt. %) $= \frac{\text{massa A} - \text{massa B}}{\text{mass X}} \text{ x } 100\%$

- Ash content (wt.%) $= \frac{\text{massa B}}{\text{mass X}} \times 100\%$
- Hemicelulosa content (%berat)

  = 100% - water content – celullose content –lignin content – ash content

3.3. Mechanical Test of Untreated Bagasse Fibers

3.3.1. Preparation

Fibers were taken from the crust of cane and also from the inside of it. The characteristic of those fibers are not the same, so the selection of samples require attention. We made frames from paper, the fibers were fixed on it by superglue. At last we cut the left and right sides of frame. The so created specimens are shown on **Fig. 3.3** and the grip technique on **Fig. 3.4**.

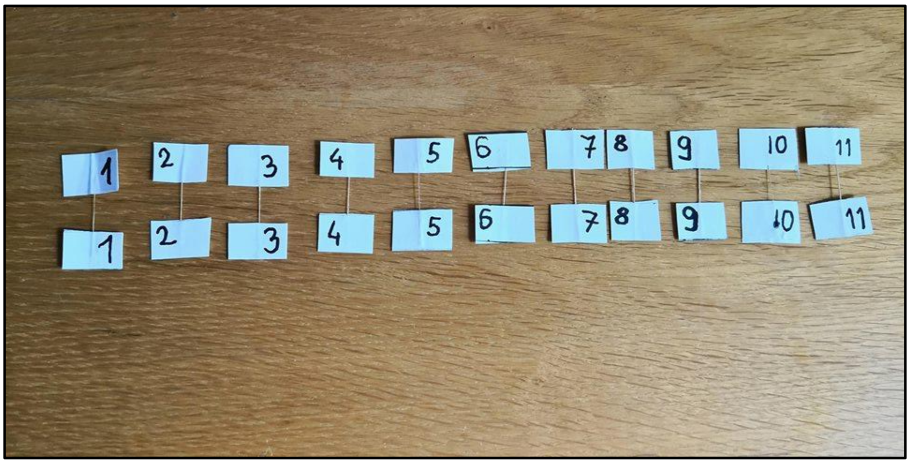


Figure 3.3: *Specimens for tensile test*

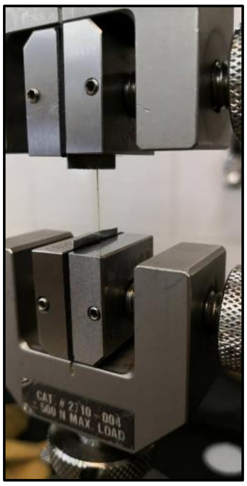


Figure 3.4: *Gripped specimen during tensile test*

Conditions: 23 °C and humidity was 50 %. The rate of speed during tensile test was 0,5 mm/min, grip length: 20 mm. The diameter of fibers was measured by manual micrometer. We can determine the diameter more accurate by Digital Optical Microscopy (DOM) if it is necessary.

3.4. Other Characterisations on Fibers

XRD, SEM, and diameter measurements were also performed on the treated fibers. The crystalline structure of the fibers was determined by X-ray diffraction measurements. The traces were recorded using a Phillips PW 1830/PW 1050 equipment with CuKα radiation at 40 kV and 35 mA anode excitation.

CHAPTER 5. RESULTS AND RESEARCH OUTPUT

4.1. Results

4.1.1. Weight Loss

Weight loss after neutralization using ethanol 70% (1 h) was in the range of 16.06 to 25.69% with the ratio of vol. ethanol used 30 ml to 1 g bagasse.

1. Weight Loss After NaOH Treatment (RT)

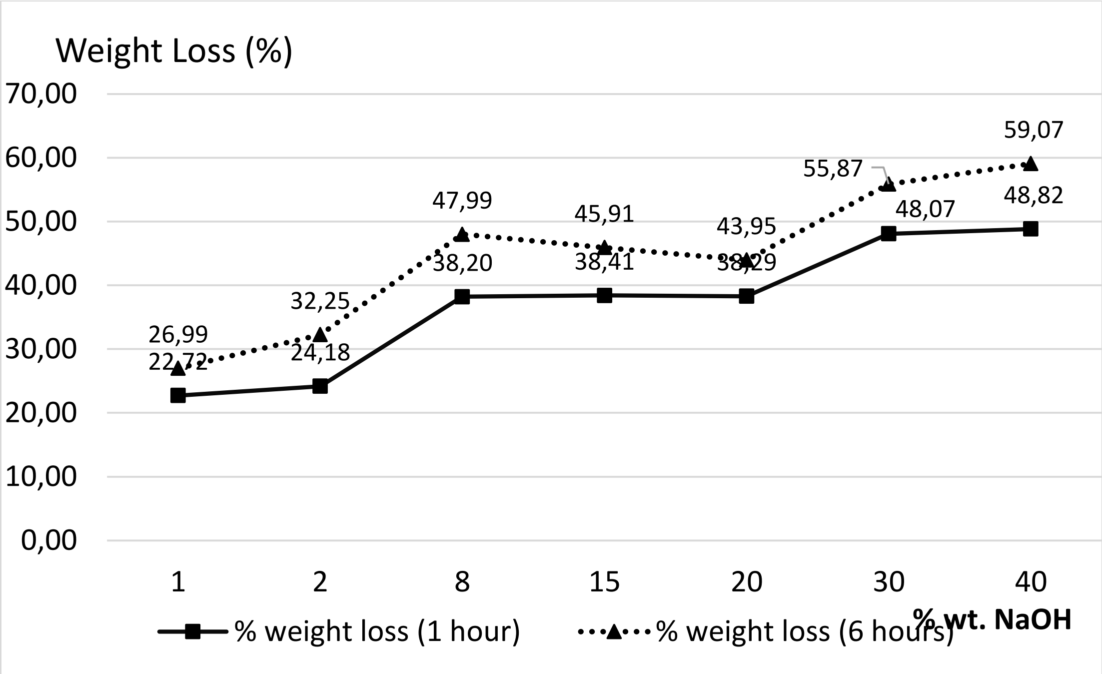


Fig. 5

1. Weight Loss After NaOH Treatment (60°C)

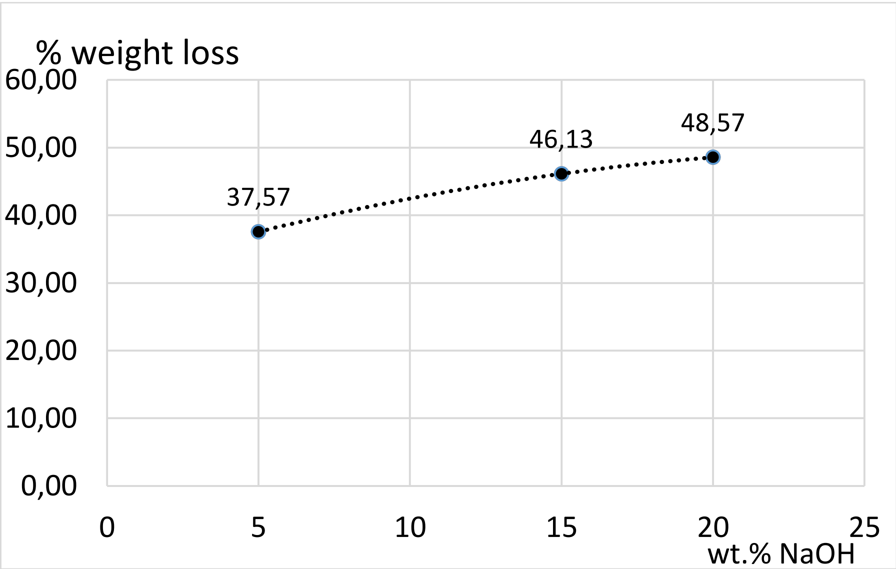


Fig. 9

4.1.2. Chemical Composition of Treated Bagasse

2. Composition Analysis of As-Received Fibers, Non-Treated Fibers, and Bagasse Outer Skin (after neutralization)

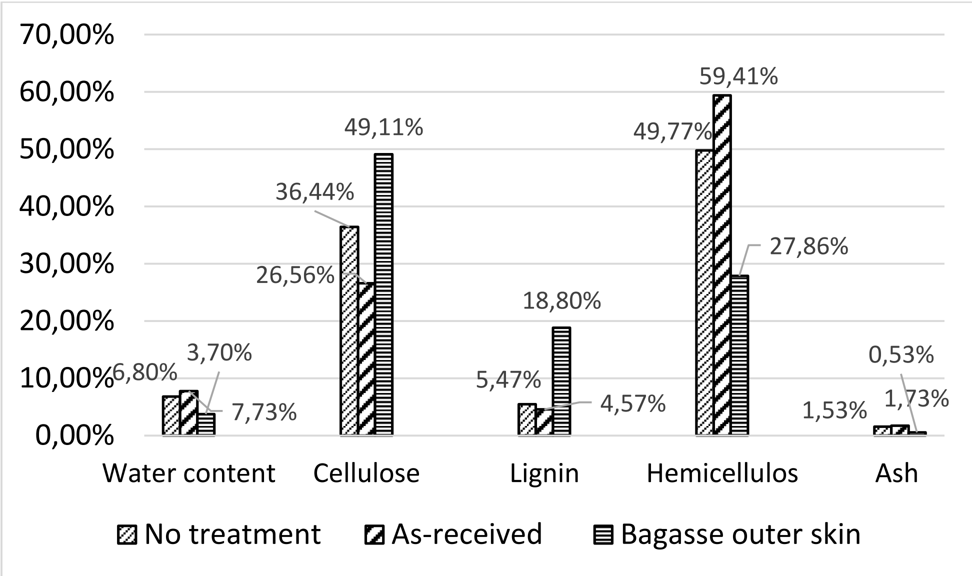


Fig. 1

3. Composition Analysis of NaOH Treated Fibers at Room Temperature (1 hour and 6 hours)
   Lignocellulose analysis was performed using Van Soest method.

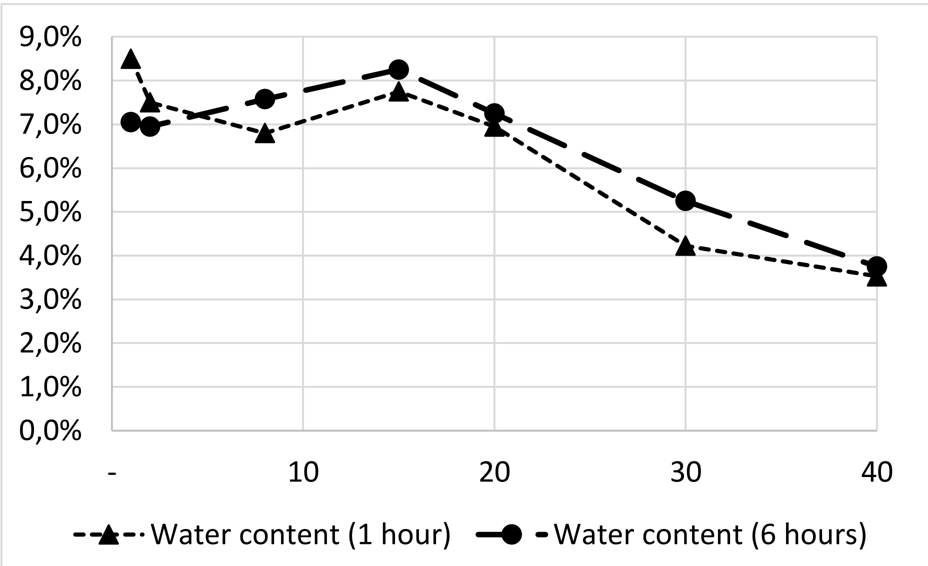
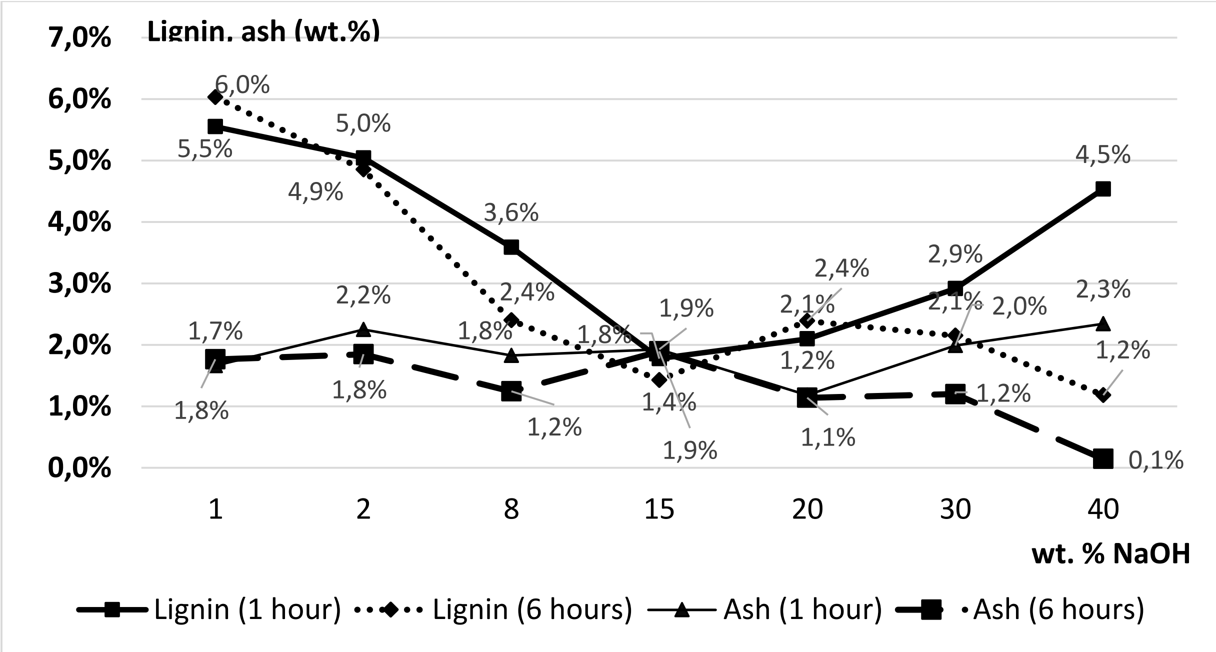
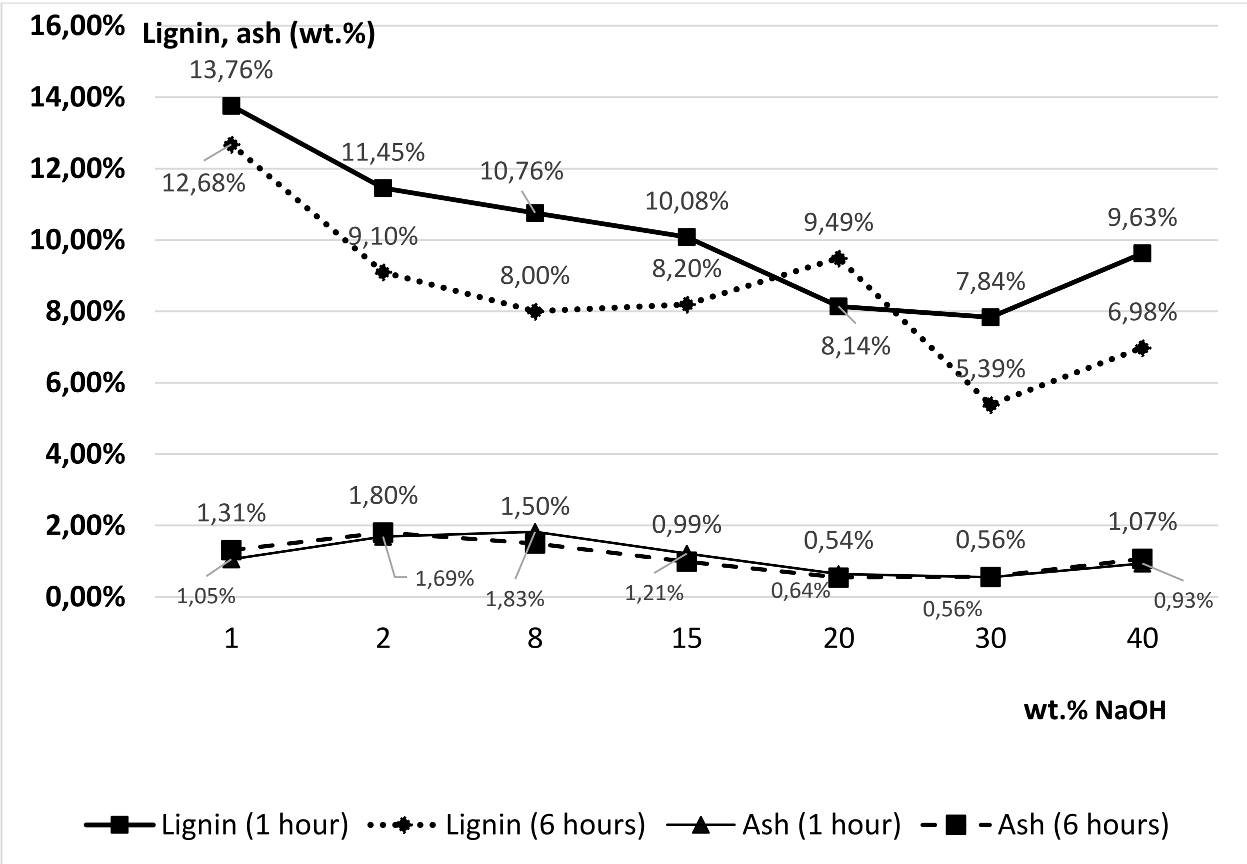


Fig. 2

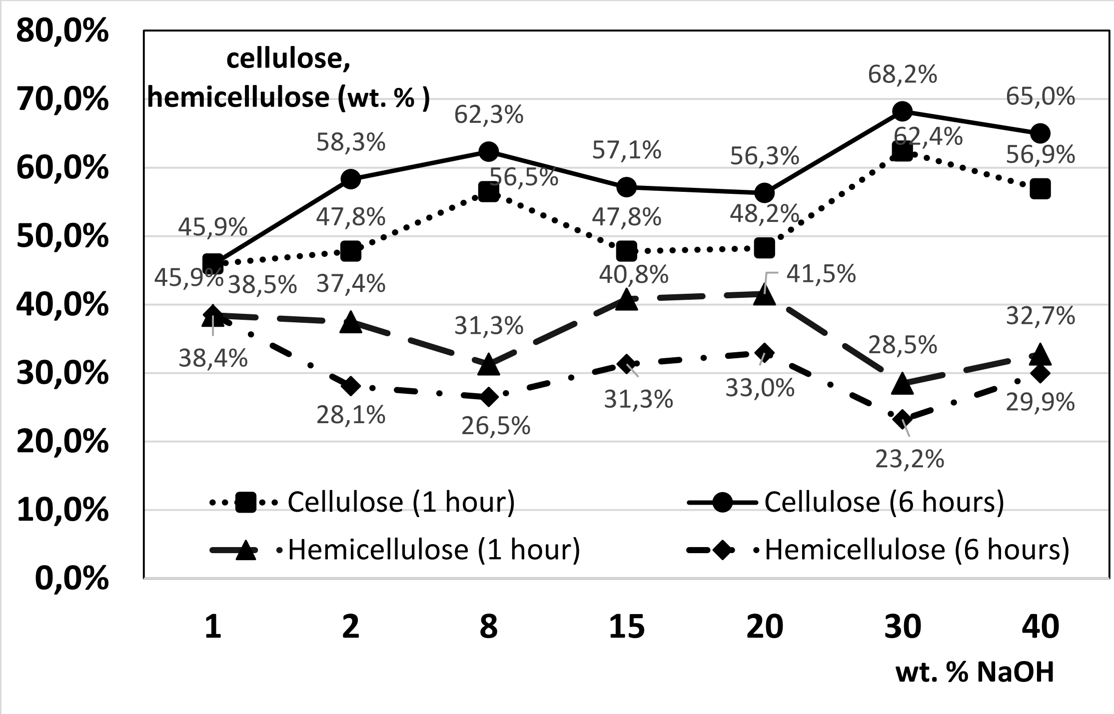

Lignin, ash (wt.%)
7,0%
6,0%
5,0%
4,0%
3,0%
2,0%
1,0%
0,0%
6,0%
5,0%
5,5%
4,9%
3,6%
4,5%
2,9%
2,4%
2,2%
2,4%
1,9%
2,1%
2,1%
2,0%
2,3%
1,7%
1,8%
1,8%
1,2%
1,2%
1,8%
1,8%
1,4%
1,2%
1,2%
1,9%
1,1%
0,1%
1
2
8
15
20
30
40
wt. % NaOH
Lignin (1 hour)
Lignin (6 hours)
Ash (1 hour)
Ash (6 hours)

a)

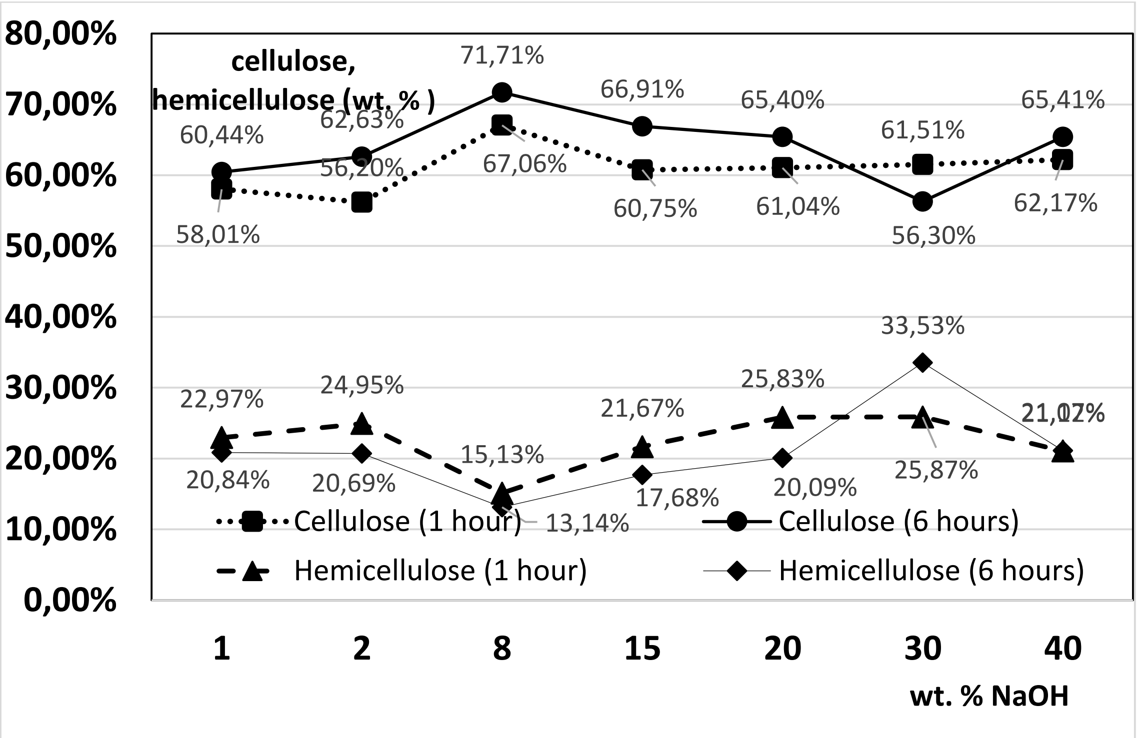

16,00%
14,00%
12,00%
10,00%
8,00%
6,00%
4,00%
2,00%
0,00%
Lignin, ash (wt.%)
13,76%
12,68%
11,45%
10,76%
9,10%
10,08%
9,49%
8,00%
8,20%
9,63%
7,84%
6,98%
8,14%
5,39%
1,31%
1,80%
1,50%
0,99%
0,54%
0,56%
1,07%
1,05%
1,69%
1,83%
1,21%
0,64%
0,56%
0,93%
1
2
8
15
20
30
40
wt.% NaOH
Lignin (1 hour)
Lignin (6 hours)
Ash (1 hour)
Ash (6 hours)

b)

Fig. 3 a) long bagasse fibers and b) < 25 mesh bagasse fibers



a)



b)

Fig. 4 a) long bagasse fibers and b) < 25 mesh bagasse fibers

4. Composition Analysis of NaOH Treated Fibers at Temperature 60°C (1 hour)

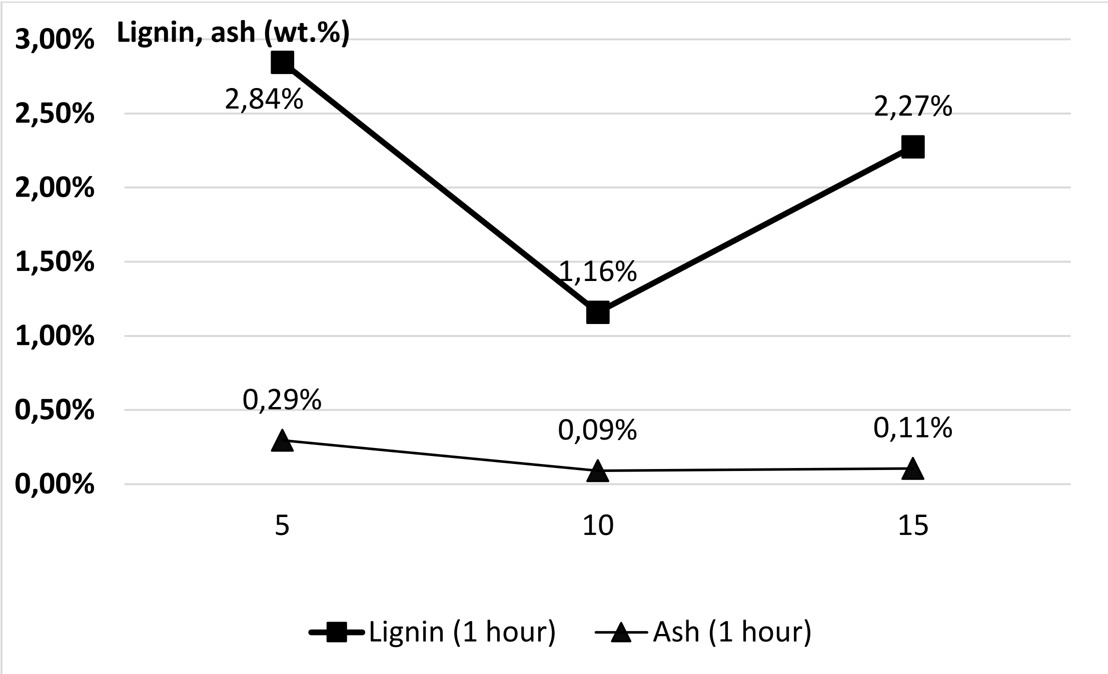


Fig. 6

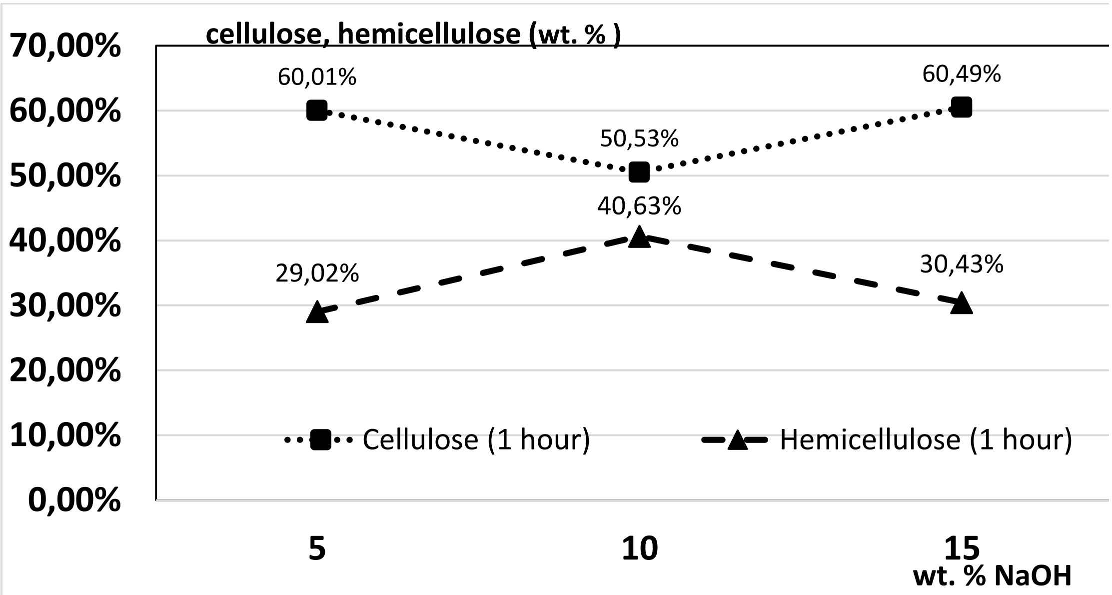
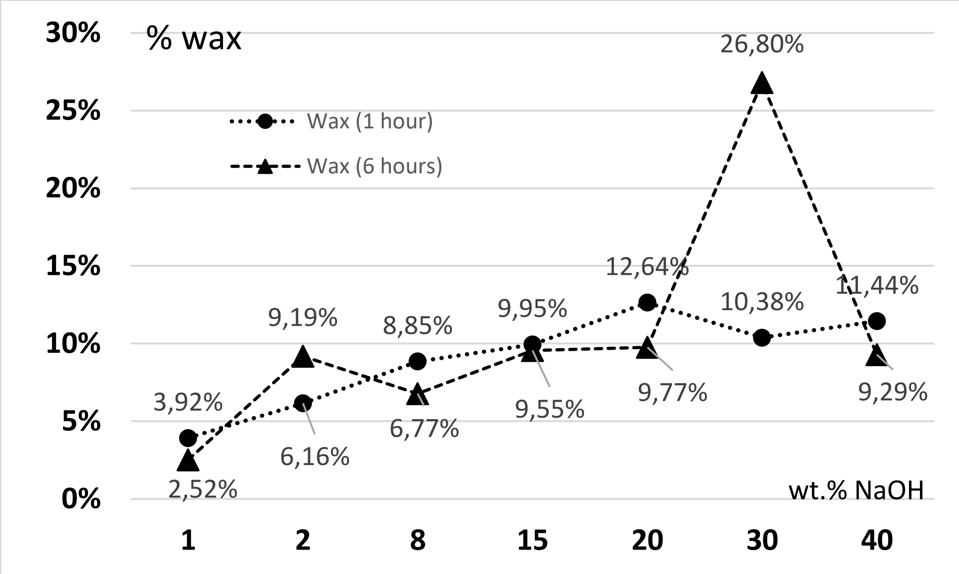
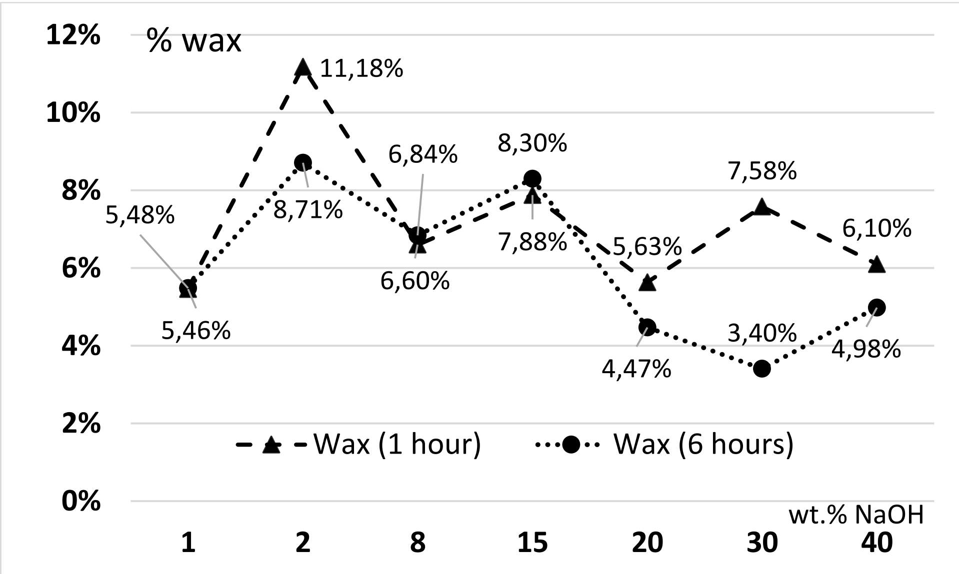


Fig. 7



a)



b)

Fig. 8 a) long bagasse fibers and b) < 25 mesh bagasse fibers

4.1.2. Tensile Strength of the Bagasse

Table 3.1: *Results of tensile test*

	Yield stress	Tensile stress at Break	Tensile strain at Yield	Tensile strain at Break	Young's modulus
	(MPa)	**(MPa)**	**(%)**	**(%)**	**(GPa)**

Specimen1	-	440,68	-	1,57	28,36
Specimen2	-	421,44	-	1,97	27,49
Specimen3	-	364,37	-	1,64	23,69
Specimen4	-	457,16	-	2,05	25,84
Specimen5	-	503,69	-	1,83	29,21
Specimen6	-	521,35	-	3,14	21,93
Specimen7	-	820,37	-	3,97	27,49
Specimen8	-	631,59	-	3,47	23,75
Specimen9	-	479,74	-	2,35	25,09
Specimen10	-	662,24	-	3,96	24,44
Average	-	530,26	-	2,60	25,73
S. D.	-	136,59	-	0,95	2,354

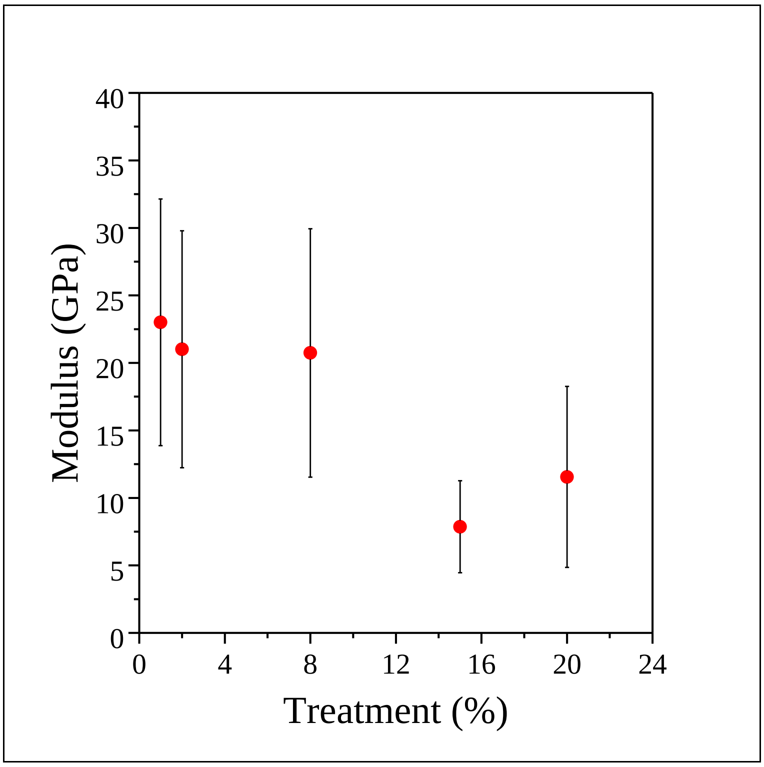


Figure 3: *Young's modulus after NaOH treatment*

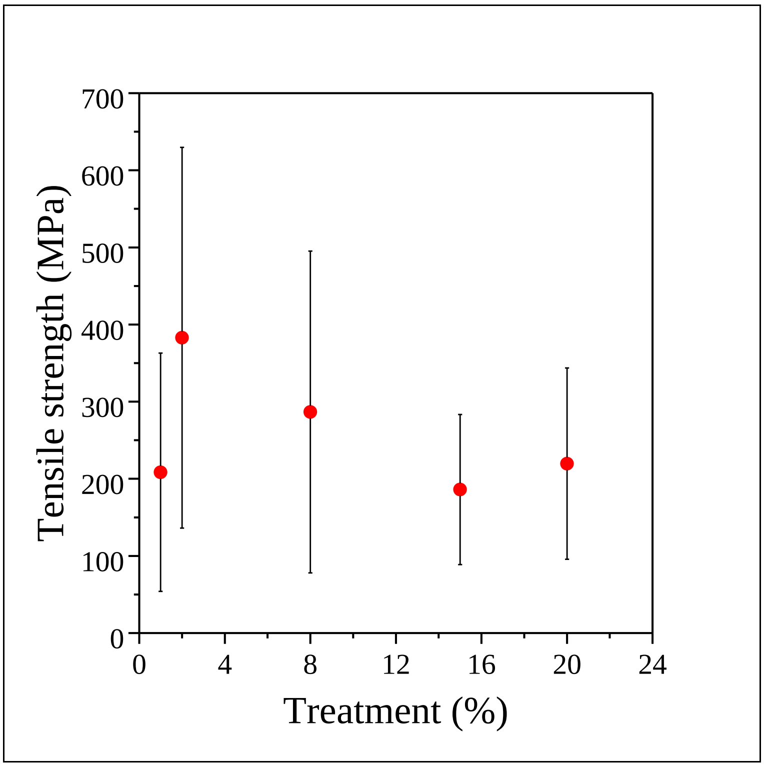


Figure 4: *Changes in the tensile strength of bagasse fibers as a function of NaOH treatment*

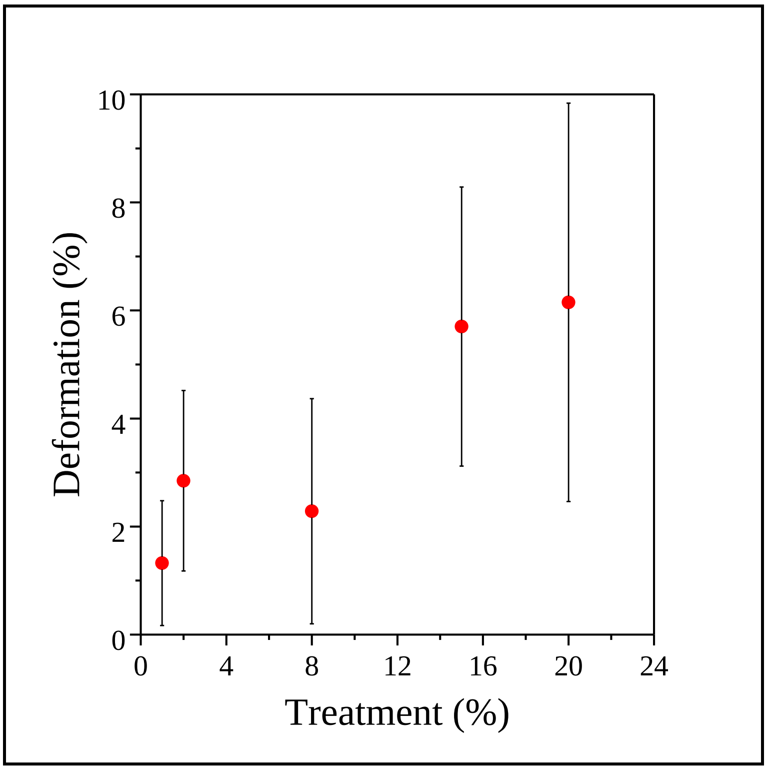


Figure 5: *Changes in deformation after NaOH treatment*

3. Chemical analysis

The Indonesian results of chemical analysis are presented here. We skip the results of 6h treatment. These results refer to long fibers. Chemical composition of the bagasse fibers were determined by Van Soest method (1967).

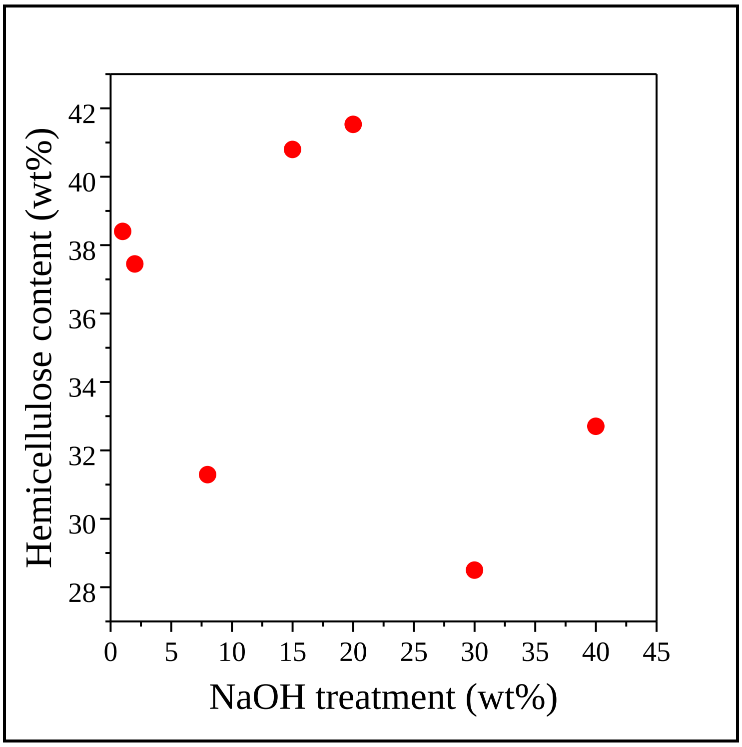


Figure 6: *Hemicellulose content of fibers after NaOH treatment*

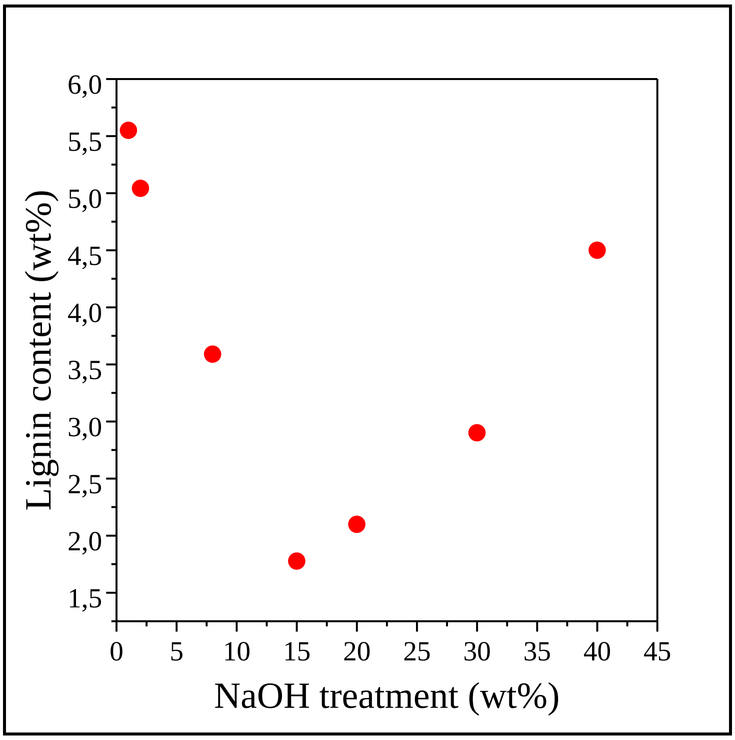


Figure 7: *Lignin content of fibers after NaOH treatment*

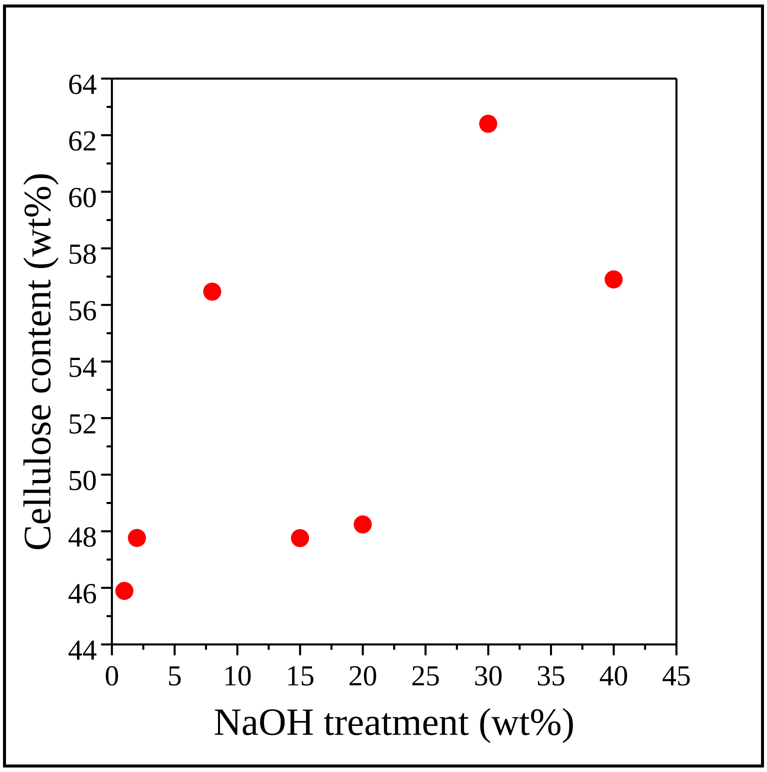


Figure 8: *Cellulose content of fibers after NaOH treatment*

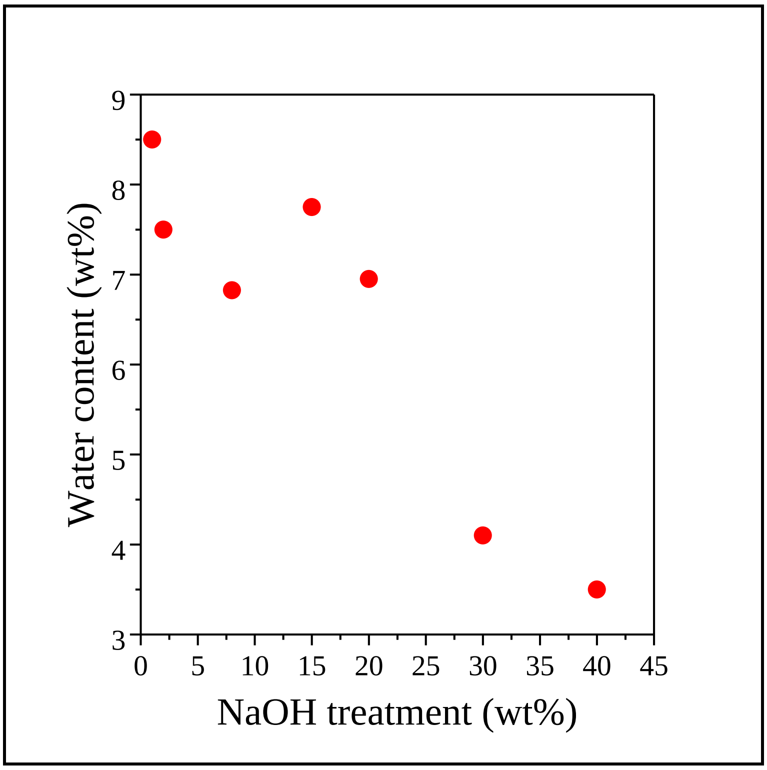


Figure 9: *Water content of fibers after NaOH treatment*

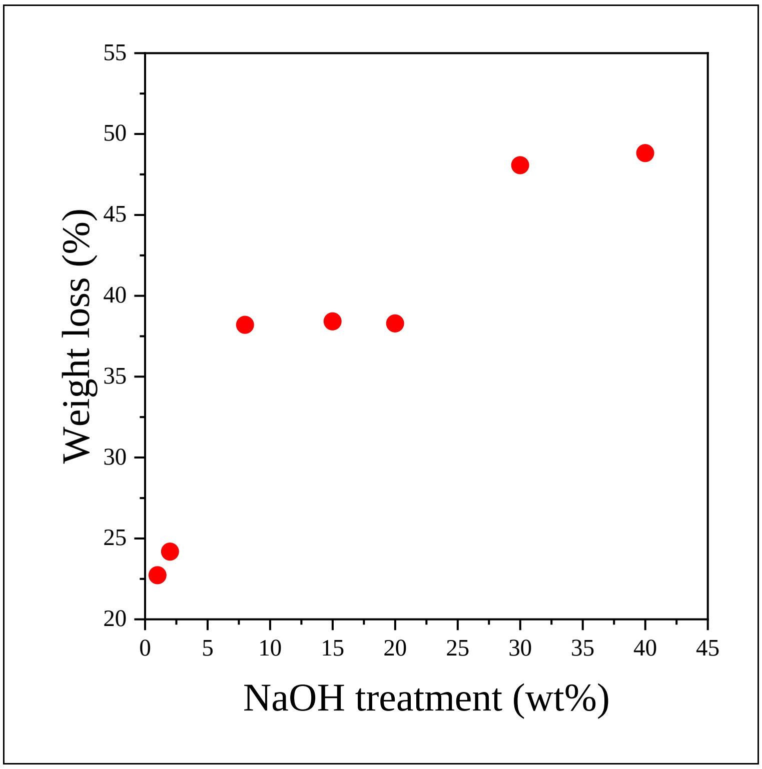


Figure 10: *Weight loss after NaOH treatment*

4. WAXS

The crystalline structure of the fibers was determined by X-ray diffraction measurements. The traces were recorded using a Phillips PW 1830/PW 1050 equipment with CuK□ radiation at 40 kV and 35 mA anode excitation.

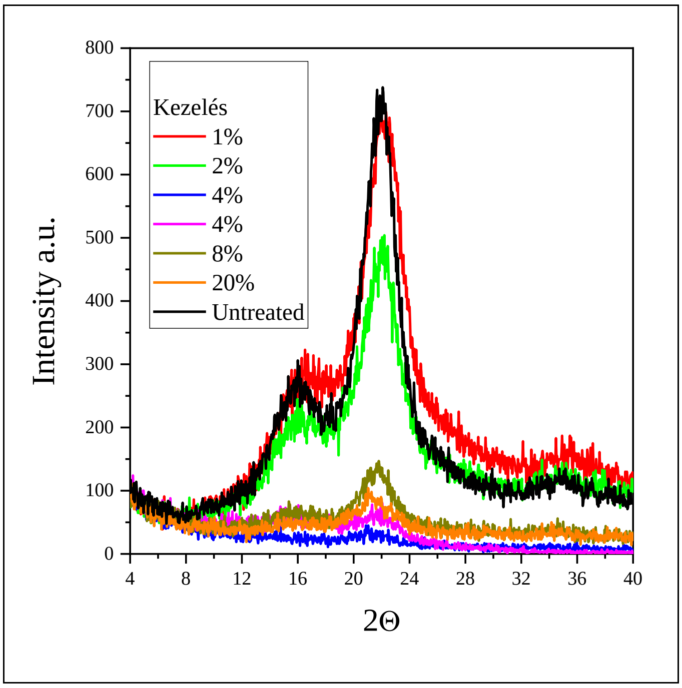


Figure 11: *The effect of NaOH treatment on crystalline structure of cellulose in bagasse fibers*

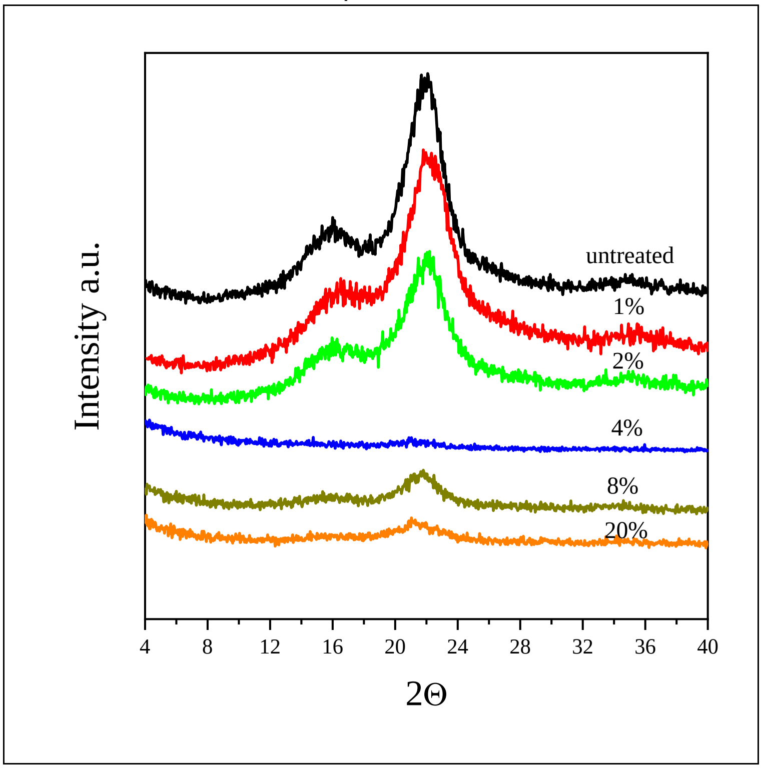


Figure 12: *The effect of NaOH treatment on crystalline structure of cellulose in bagasse fibers (shifted)*

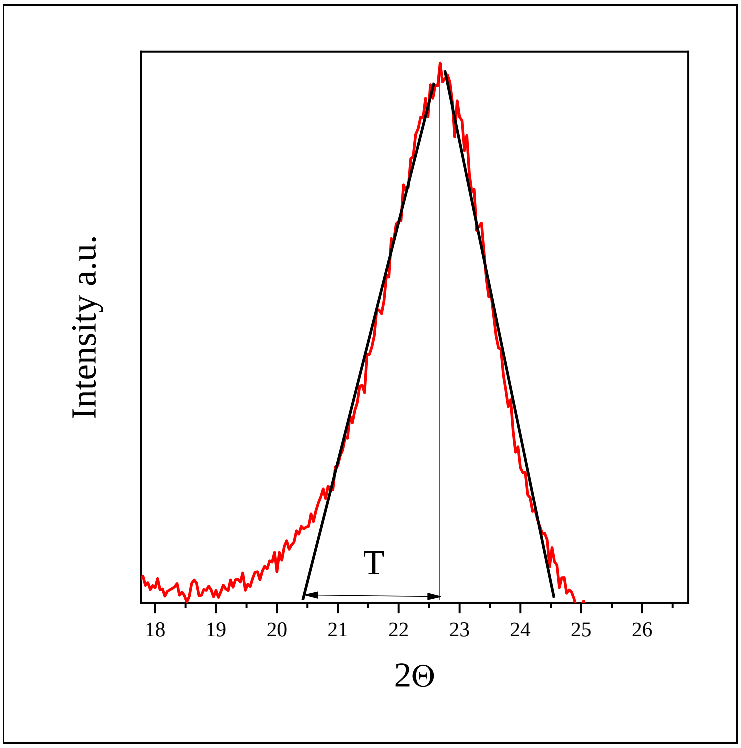


Figure 13: *Method for determining Microfibril Angle (MFA)*

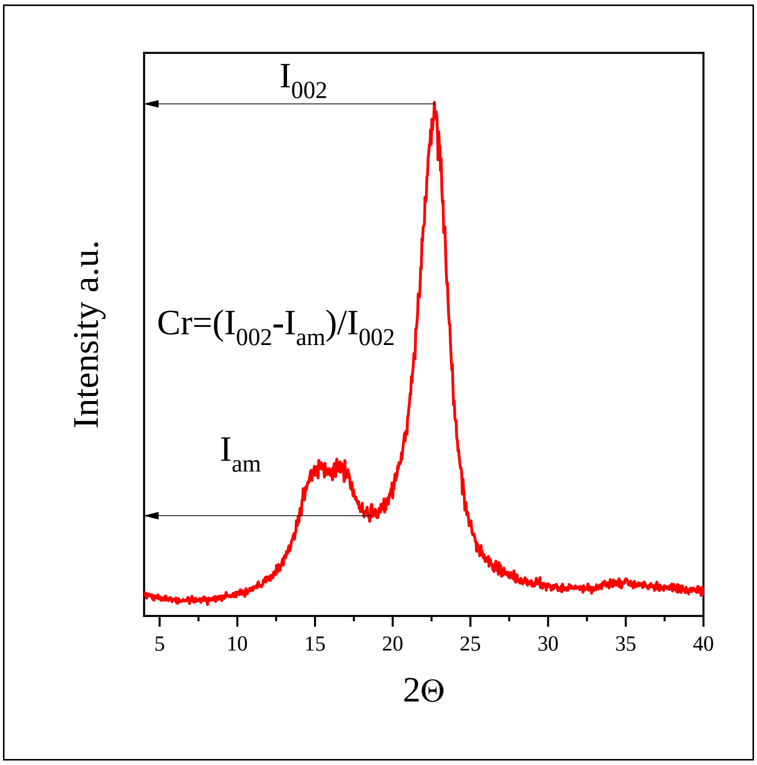


Figure 14: *Method for determining the degree of crystallinity of cellulose*

Table 2: *Characteristics based on WAXS results*

Bagasse fibers			
Treatment (wt%)	**T**	**MFA (º)**	**Cr (%)**
0	2.51	25.3	70.5
1	2.54	25.1	63.4
2	2.50	25.3	62.9
4	-	-	-
8	2.53	25.2	60.7
20	2.38	25.8	55.0

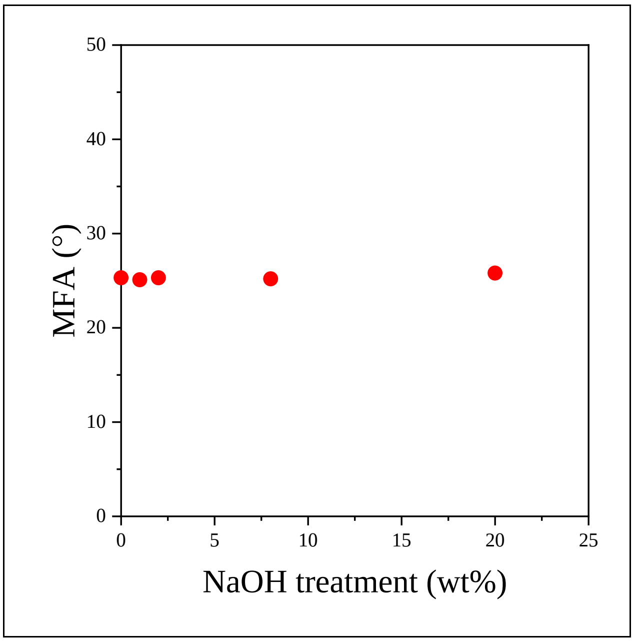


Figure 15: *MFA in a function of NaOH treatment*

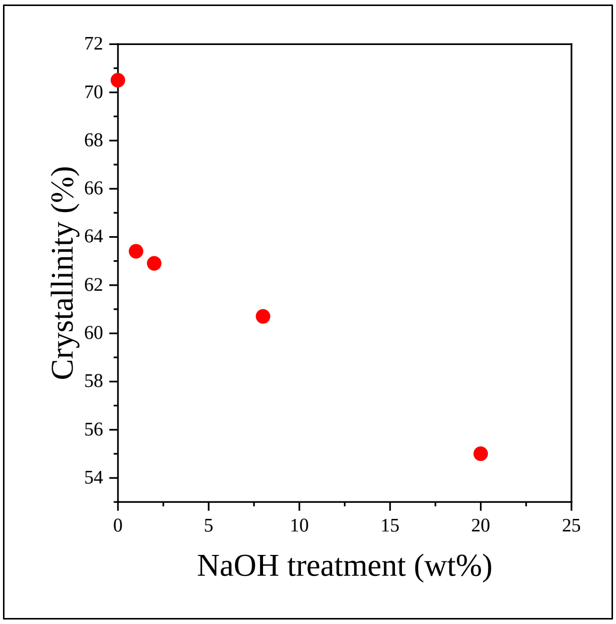


Figure 16: *Changes in crystallinity after NaOH treatment*

5. Correlations

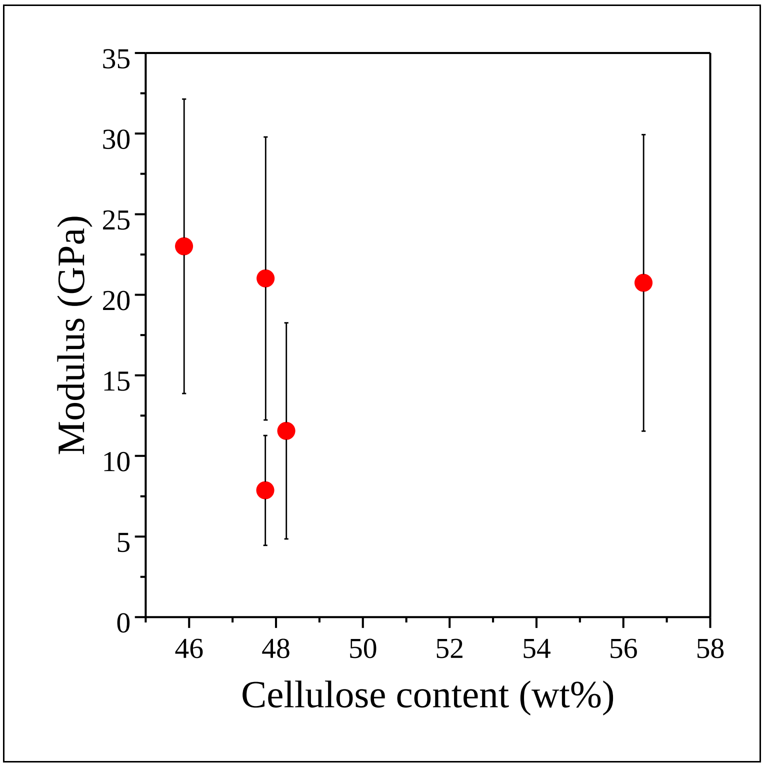


Figure 17: *Young's modulus vs. cellulose content*

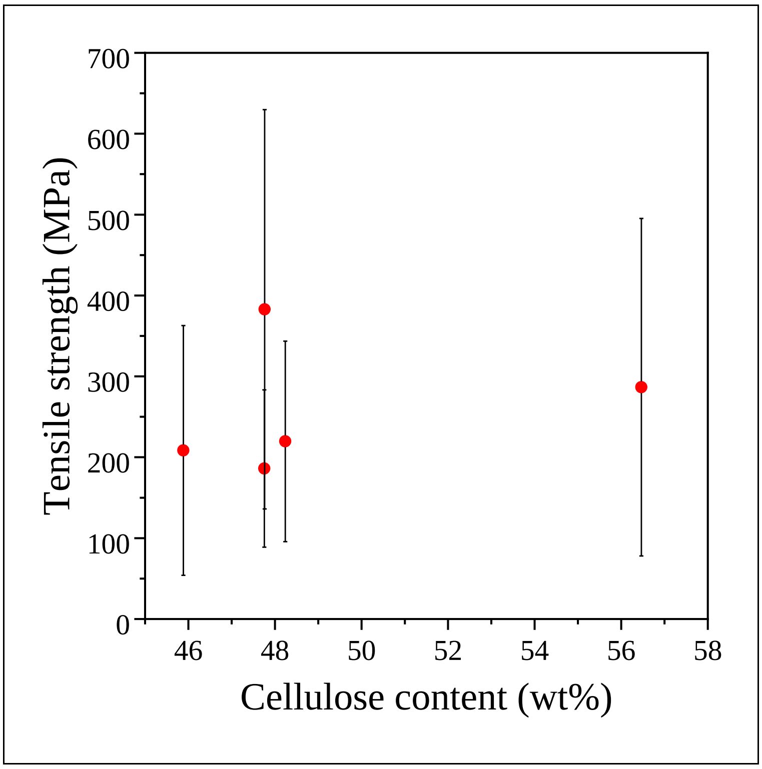


Figure 18: *Tensile strength vs. cellulose content*

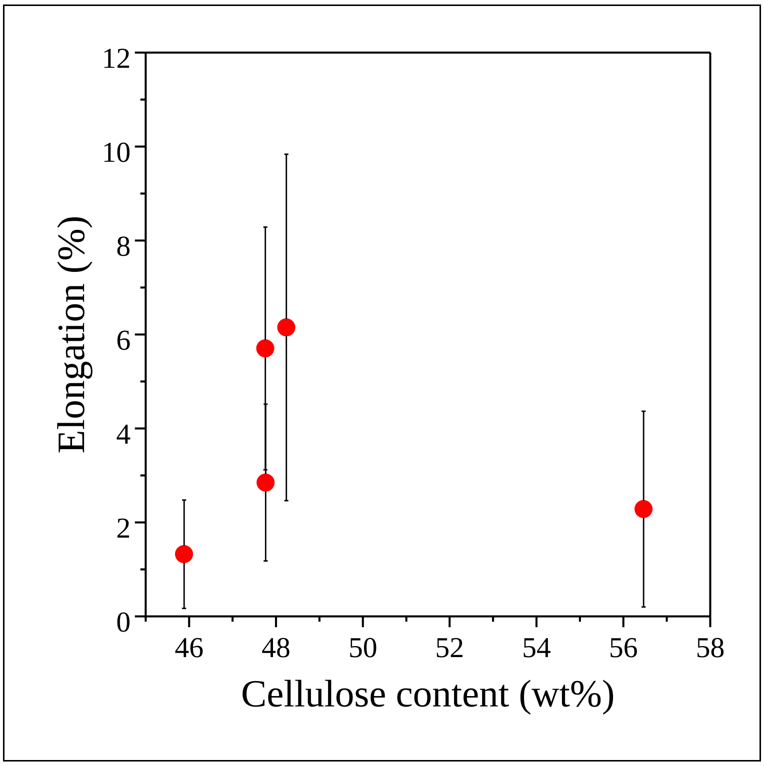


Figure 19: *Elongation vs. cellulose content*

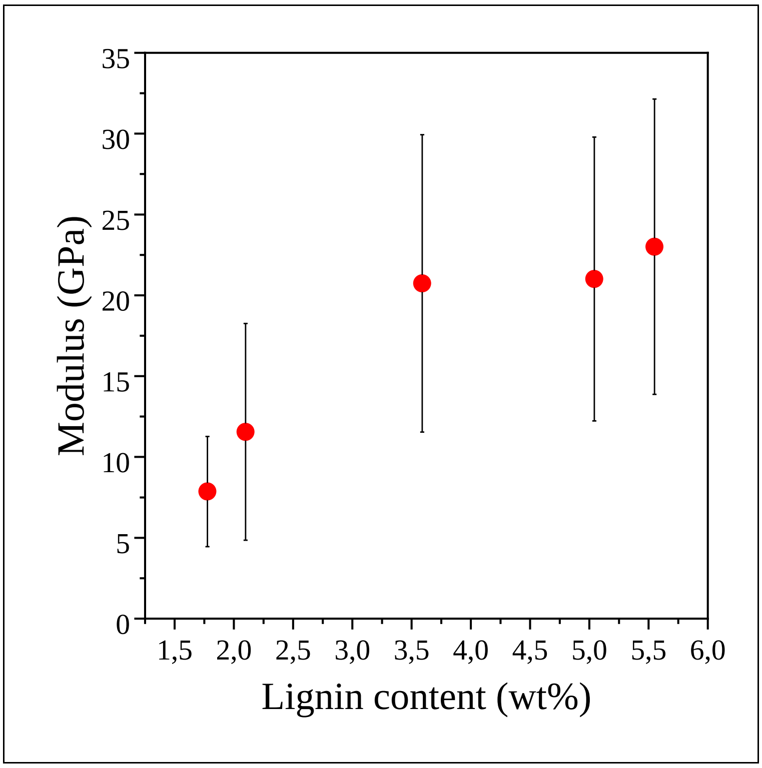


Figure 20: *Young's modulus vs. lignin content*

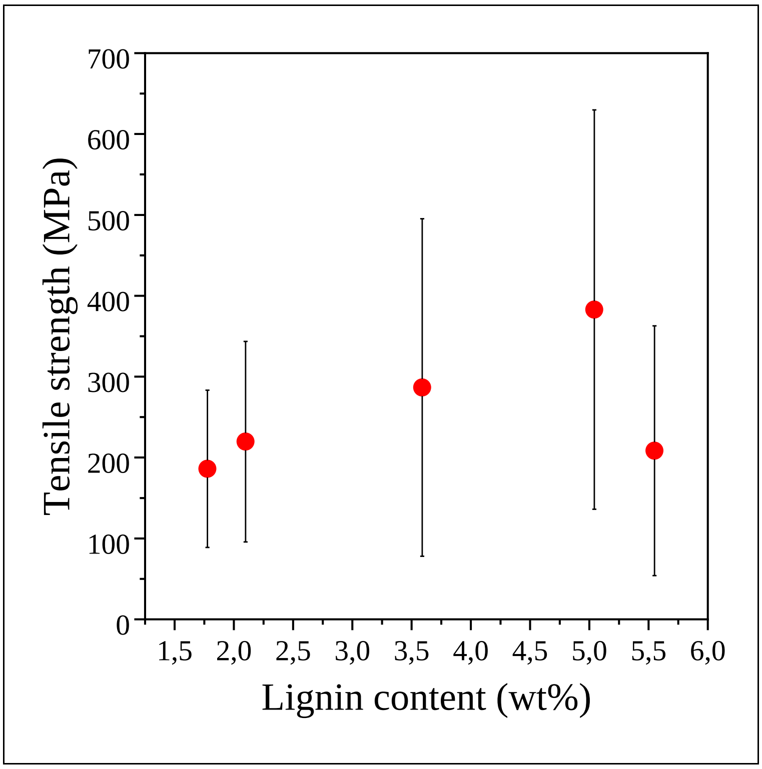


Figure 21: *Tensile strength vs. lignin content*

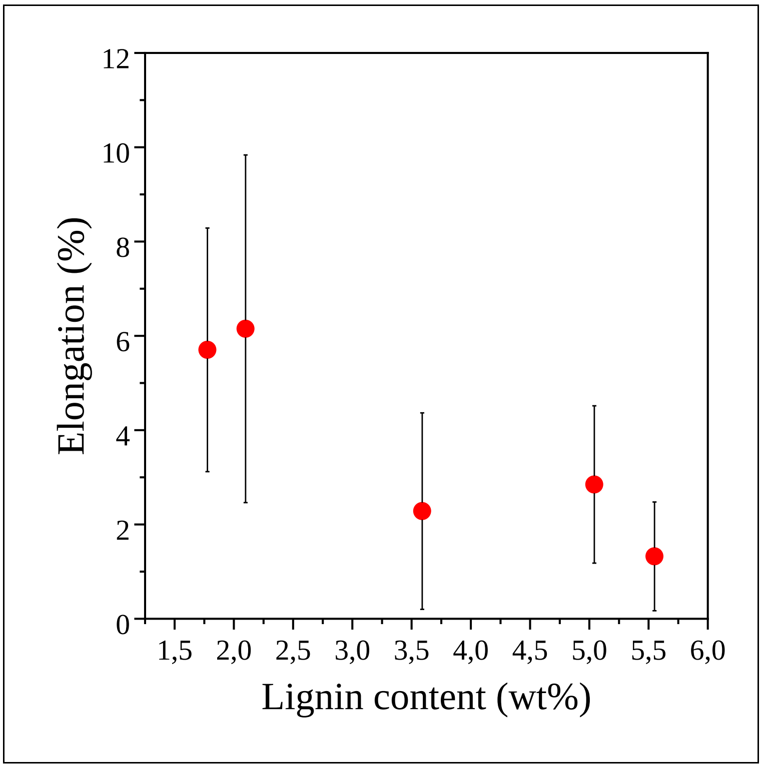


Figure 22: *Elongation vs. lignin content*

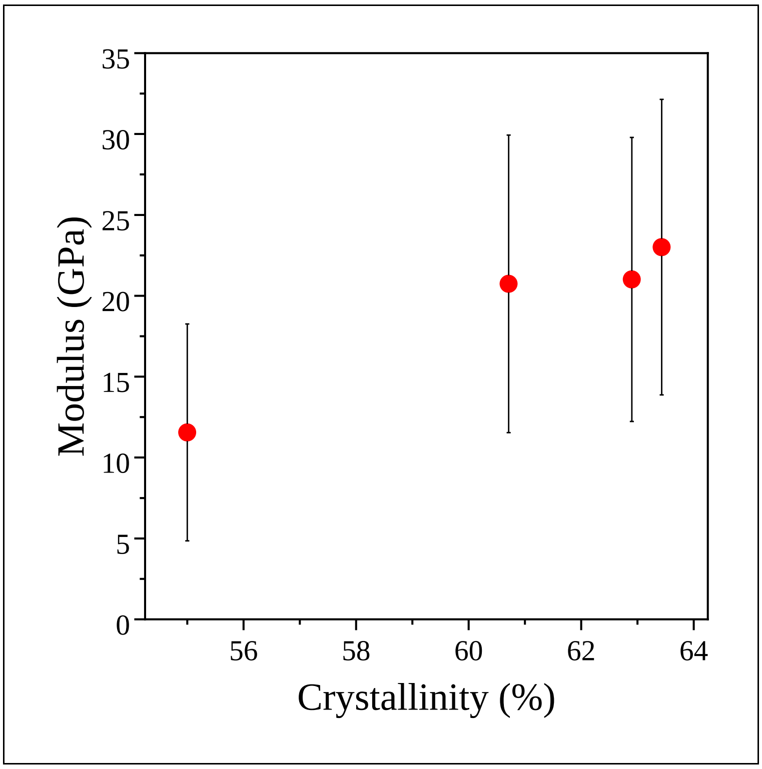


Figure 23: *Young's modulus vs. crystallinity*

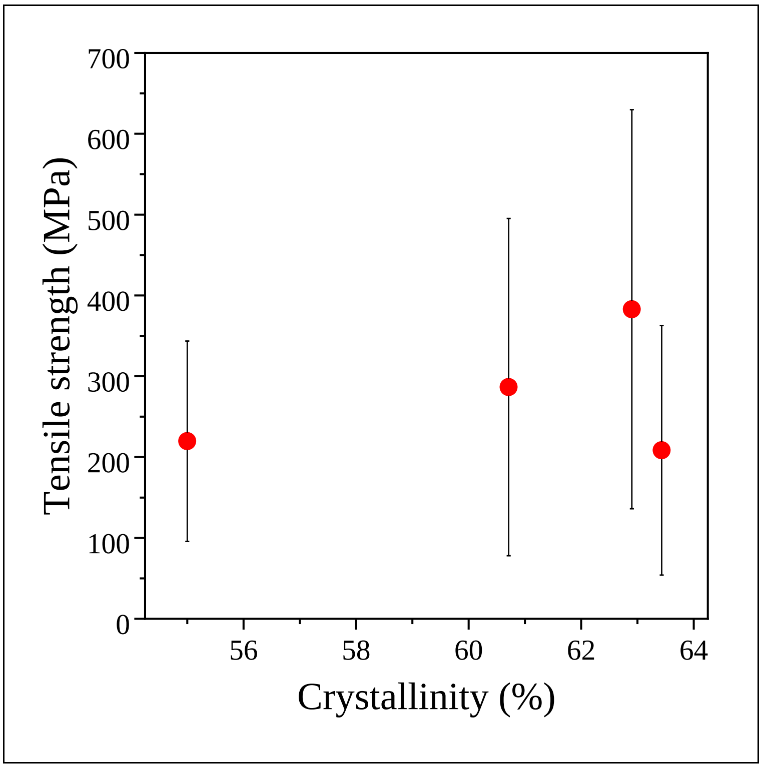


Figure 24: *Tensile strength vs. crystallinity*

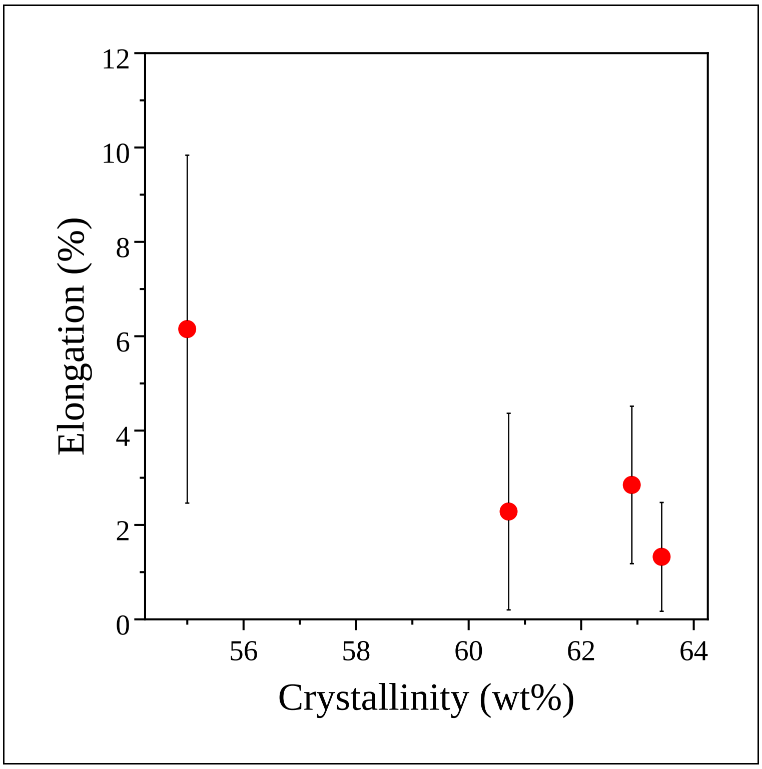


Figure 25: *Tensile strength vs. crystallinity*

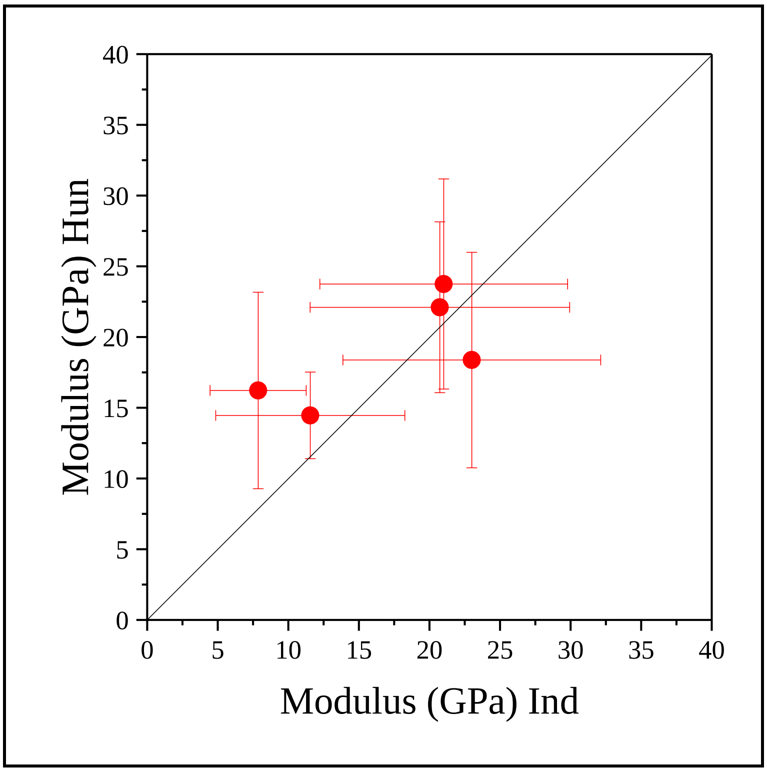


Figure 26: *Young's modulus of fibers treated in Indonesia and in Hungary*

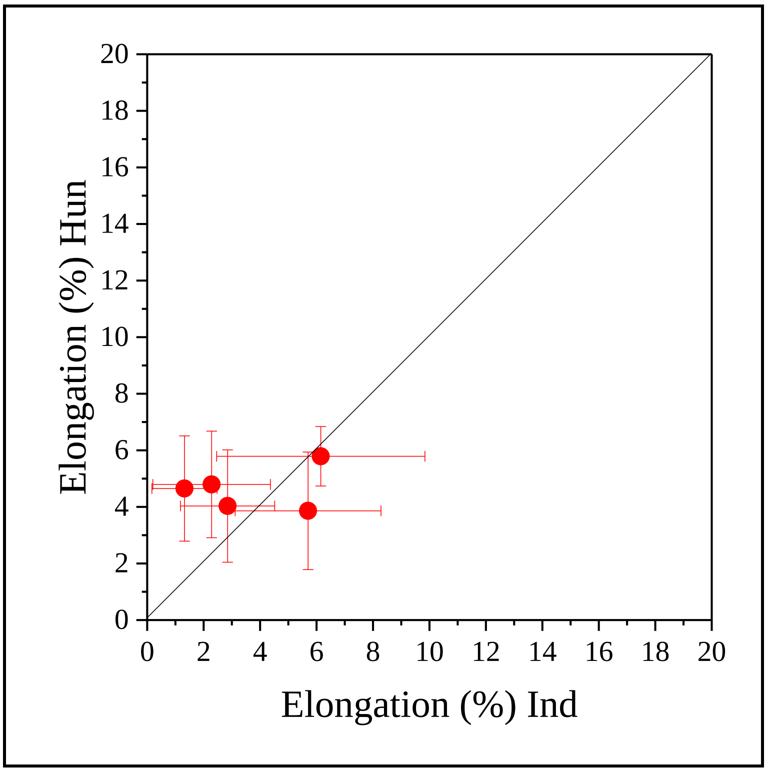


Figure 27: *Elongation of fibers treated in Indonesia and in Hungary*

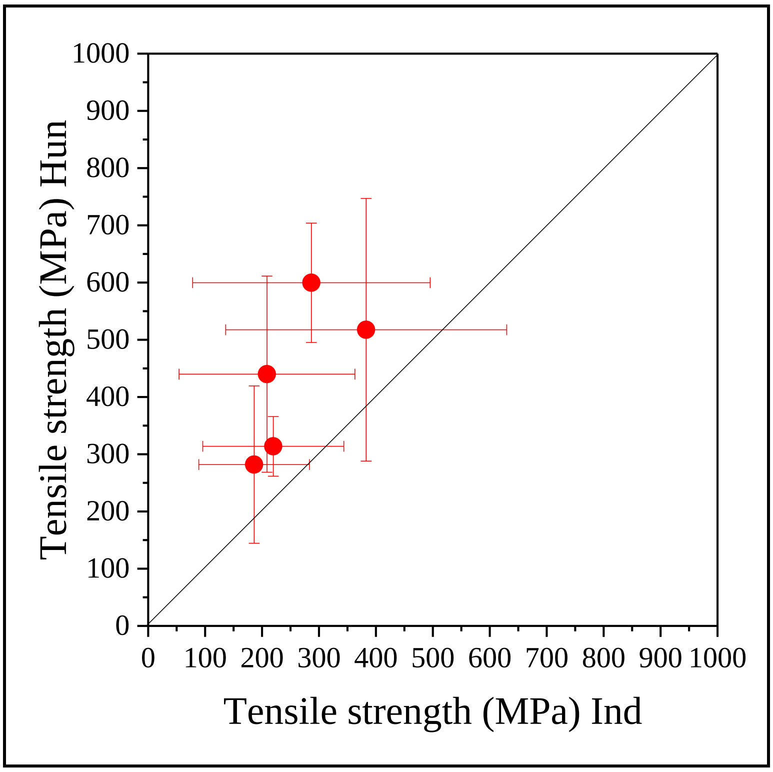


Figure 28: *Tensile strength of fibers treated in Indonesia and in Hungary*

CHAPTER 6. NEXT RESEARCH PLAN

Second year Planned Research Work to Prepare Biocomposite Sugarcane Bagasse Reinforced PP and PLA

Table 1. Workplan for preparing bagasse fiber reinforced PP and PLA composites

WP Bagasse Composites				
Matrix	**Bagasse**		**Coupling Agent**	**Progress**
PP H649	Fibrous (L=10±4 mm)	Untreated		☑
			MAPP (Scona 2112)	☑
	Powdery (L~400 µm)	Untreated		
			MAPP (Scona 2112)	
	Fibrous (L=10±4 mm)	Treated		
			MAPP (Scona 2112)	
	Powdery (L~400 µm)	Treated		
			MAPP (Scona 2112)	
PLA 4032D	Fibrous (L=10±4 mm)	Untreated		
			MAPLA	
	Powdery (L~400 µm)	Untreated		
			MAPLA	
	Fibrous (L=10±4 mm)	Treated		
			MAPLA	
	Powdery (L~400 µm)	Treated		
			MAPLA	
EFC Reference				
PP H649	EFC 1000			☑
			MAPP (Scona 2112)	☑
PLA 4032D	EFC 1000			
			MAPLA	

<u>Material dan Processes Used:</u>

1) PP H649 – MFR = 2.5 g/10 min (230 °C, 2.16 kg) – MOL Group Ltd., Hungary
2) PLA 4032D – MFR = 7 g/10 min (210 °C, 2.16 g) – Natureworks LLC, MN, USA
3) Bagasse – Indonesia, sieved and separated into two fractions (fibrous and powdery)
4) Wood flour Filtracell EFC 1000 – Av. particle size: ~210 µm - J. Rettenmaier and Söhne GmbH, Germany

5) MAPP Scona 2112 – MFR 4-8 g/10 min (190 °C, 2.16 kg), MAH content: 0.9-1.2 % - BYK-Chemie GmbH, Germany
6) Compounding by twin-screw extrusion (Brabender DSK 42/7), 170-180-185-190 °C, 40 min^{-1}
7) Tensile bars by injection molding, 40-170-180-185-190 °C

CHAPTER 7. CONCLUSIONS AND RECOMMENDATION

The chemical composition and physical characteristics of bagasse fibers changed considerably as an effect of alkali treatment. A maximum was observed in the strength of the fibers as a function of NaOH concentration (8 wt.%), which probably explains the beneficial effect of such treatment on composite properties.

The second year work will be applied 8wt.% NaOH treatment on the bagasse fibers before incorporated with polymer matrix of PP and PLA.

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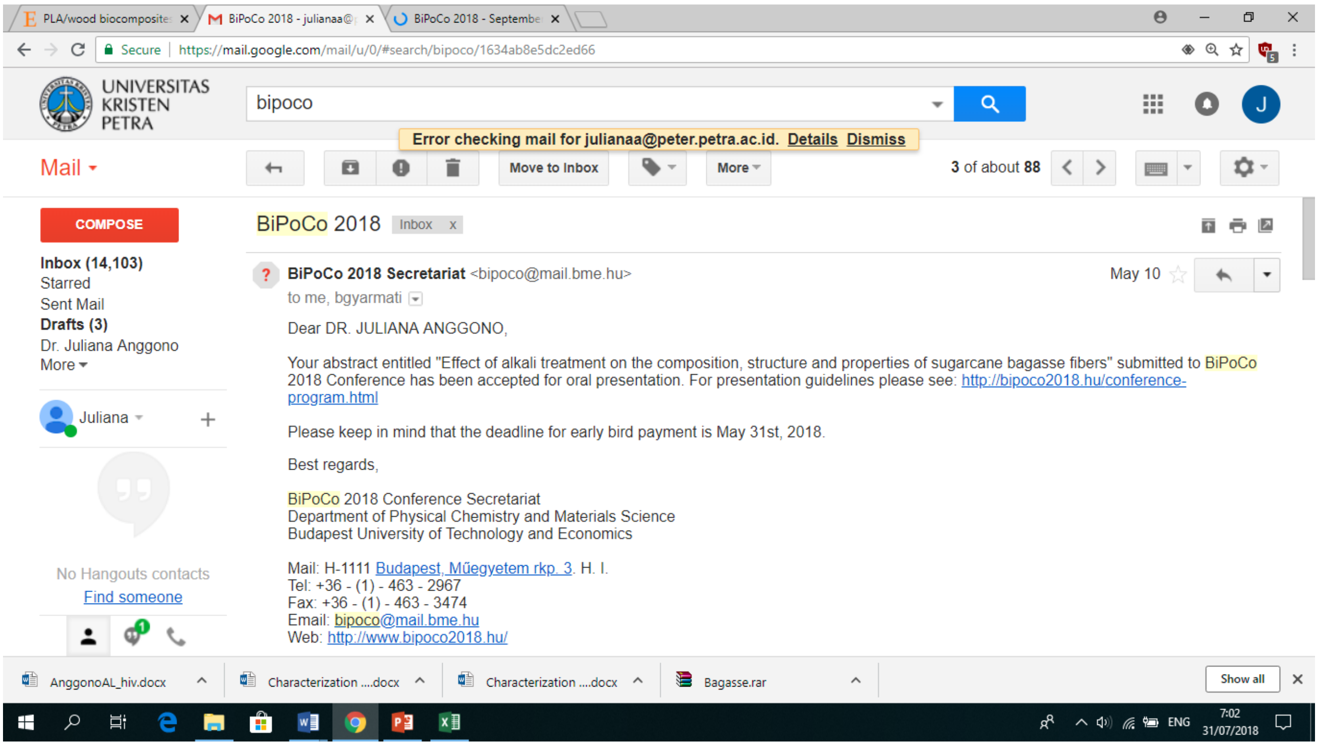
APPENDICES

Appendix 1. Call for Paper at 4th Bi



Appendix 2. Draft Paper

Effect of alkali treatment on the composition, structure and properties of sugarcane bagasse fibers

Juliana Anggono[1], Felycia E. Soetaredjo[2], Ágnes Elvira Farkas[3,4], András Bartos[3,4], János Móczó[3,4], Béla Pukánszky[3,4],Antoni[5], Hariyati Purwaningsih[6]

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Abtract

Reports have been published in the literature showing the beneficial effect of alkali treatment of lignocellulosic fibers on the properties of their composites. Bagasse fibers were treated with sodium hydroxide solutions of different concentrations and the chemical composition and physical characteristics of the fibers were determined in this research. Considerable changes in chemical composition and a maximum in fiber strength was observed as a function of NaOH concentration.

Introduction

In recent years, the interest in wood and natural fiber reinforcement of polymers increased considerably due to the increased environmental awareness of both the industry and the public, but also because of economic reasons. The properties prepared from neat natural fibers are often rather poor [1], because of weak interactions between the fibers and the polymer and/or due to the small perpendicular strength of these lignocellulosic reinforcements [1]. Interactions can be improved by surface modification, while the inherent strength of the reinforcement increases by various treatments [2]. Numerous reports have been published in the literature showing the beneficial effect of alkali treatment of lignocellulosic fibers on the properties of their composites [3]. Hardly any or very limited explanation has been given for the phenomenon in most cases. The goal of this study was to investigate the question further and to identify the possible reasons leading to the improvements reported.

Experimental

The sugarcane bagasse was obtained directly from the sugar mill. Individual fibers or small fiber bundles were separated from larger pieces for mechanical testing. The fibers were fixed to a frame and treated with NaOH solutions of different concentrations from 0 to 40 wt% alkali content. The mechanical properties of the fibers were determined by tensile testing using paper frames. The measurements were done at 0.5 mm/min rate and 20 mm gauge length. The crystalline structure of the fibers was determined by X-ray diffraction measurements. The traces were recorded using a Phillips PW 1830/PW 1050 equipment with CuK_{α} radiation at 40 kV and 35 mA anode excitation. The chemical composition of the fibers was determined by the van Soest method [4]. The characterization yielded the cellulose, hemicellulose, lignin, wax and water content of the fibers. Ash content was also determined.

Results and discussion

Alkali treatment led to a considerable change in both the chemical composition and the physical characteristics of the fibers. The fibers lost weight during the treatment and the weight loss became considerable, as much as 50 %, at the largest NaOH concentration. The hemicellulose and lignin content of the fibers decreased, while their cellulose content increased in accordance with expectations. The standard deviation of the measurements is rather large, thus the results are not extremely accurate, but the tendency of the changes are clear. According to the XRD measurements, the crystal form of cellulose did not change during treatment, but at large alkali content the samples disintegrated quite significantly and their crystalline character became less pronounced that was somewhat surprising. Similarly to chemical composition, the mechanical properties of the fibers also changed considerably. Their stiffness decreased, while their deformability increased slightly, which was also somewhat unexpected. As Fig. 1 shows, a maximum was observed in the tensile strength of the fibers, which probably explains the improvement of composite strength as the result of alkali treatment. XRD analysis did not show any change in the characteristic helix angle of the fibers, which is claimed to determine the stiffness and strength of lignocellulosic reinforcements. Further analysis of the results is needed for revealing the reason for the beneficial effect of alkali treatment.

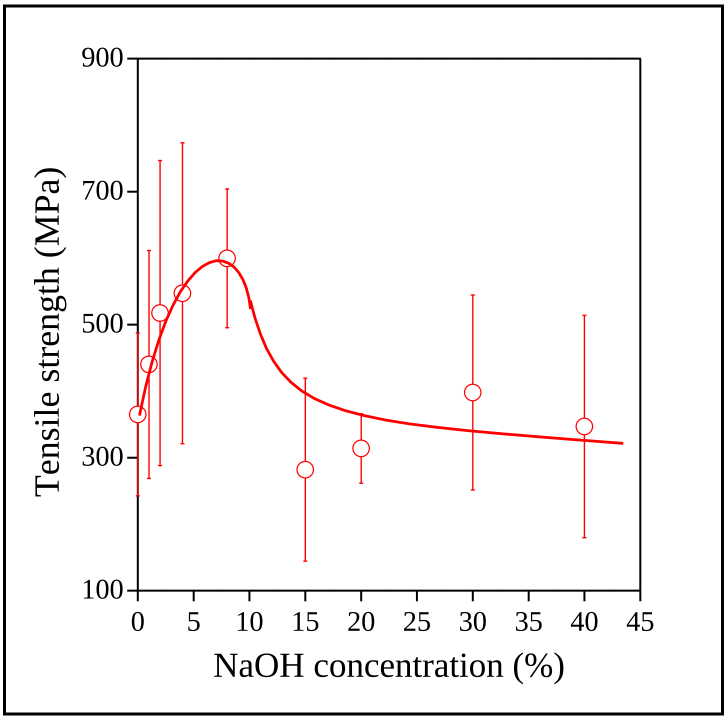

Fig. 1 *Changes in the tensile strength of bagasse fibers as an effect of alkali treatment at different NaOH concentrations.*

Conclusions

The chemical composition and physical characteristics of bagasse fibers changed considerably as an effect of alkali treatment. A maximum was observed in the strength of the fibers as a function of NaOH concentration, which probably explains the beneficial effect of such treatment on composite properties.

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Appendix 3. Submitted Paper

Manuscript Details

Manuscript number	EUROPOL_2018_1955
Title	DEFORMATION AND FAILURE OF SUGARCANE BAGASSE REINFORCED PP
Article type	Research paper

Abstract

Polypropylene composites were prepared from sugarcane bagasse fibers by extrusion and injection molding. Wood flour was used as reference filler in the study. The fiber content of the composites changed between 0 and 30 wt% in 5 wt% steps. Maleated polypropylene was used as coupling agent to improve interfacial adhesion. Mechanical properties were characterized by tensile and fracture testing, while local deformation processes were followed by acoustic emission and instrumented impact testing, as well as by the analysis of scanning electron micrographs. The results showed that sugarcane bagasse fibers reinforce polypropylene similarly to other natural fibers. They increases stiffness, but decrease tensile yield stress, tensile strength and deformability. Increased interfacial adhesion leads to the considerable improvement of reinforcement. Bagasse fiber and wood flour filled composites have very similar properties. The impact resistance of the composites increased in the presence of both fibers compared to the neat matrix. Debonding is the dominating process in the absence of the coupling agent, while mainly fiber fracture occurs in its presence. Increased plastic deformation after debonding results in slightly improved impact resistance.

Keywords	natural fiber reinforcement, mechanical properties, fracture resistance, instrumented impact testing, interfacial adhesion, local deformation processes
Manuscript category	Regular Paper
Corresponding Author	Janos Moczo
Order of Authors	Juliana Anggono, Ágnes Elvira Farkas, András Bartos, Janos Moczo, Antoni Antoni, Hariyati Purwaningsih, Bela Pukanszky
Suggested reviewers	Christoph Burgstaller, Tamás Tábi, Claudia Pretschuh, Ivan Chodak, Andrea Lazzeri

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BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS

Department of Physical Chemistry and Material Science
Laboratory of Plastics and Rubber Technology

Budapest, October 17, 2018

Dear Professor Gyarmati,

Please find enclosed the manuscript " DEFORMATION AND FAILURE OF SUGARCANE BAGASSE REINFORCED PP " by Juliana Anggono et al. for your kind consideration to be reviewed and published in European Polymer Journal. The paper deals with biocomposites derived from agricultural waste. Structure - property correlations, as well as deformation and failure characteristics of PP/sugarcane bagasse composites were investigated.

Hereby we confirm that the manuscript or its contents in some other form, has not been published previously by any of the authors and/or is not under consideration for publication in another journal at the time of submission and all the authors have seen and approved the submission of the manuscript.

I thank you for your consideration and send you my best regards.

Yours sincerely
János Móczó

✉ H-1521 Budapest, Műegyetem rkp. 3. H/I. ☎ Tel: (36-1) 382-6569 Fax: (36-1) 463-3474
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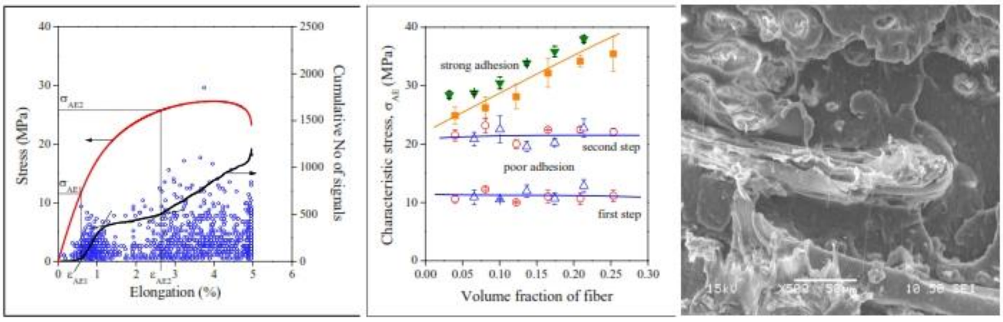
Highlights

- PP/sugarcane bagasse composites were prepared from agricultural waste.
- Sugarcane bagasse fibers reinforce polypropylene similarly to other natural fibers.
- The analysis of local deformation processes indicated that debonding is the dominating process in the absence of the coupling agent, while mainly fracture occurs in its presence.
- Increased plastic deformation after debonding results in slightly improved impact resistance.


Stress (MPa)
Cumulative No of signals
Elongation (%)
Characteristic stress, σ AE (MPa)
strong adhesion
second step
poor adhesion
first step
Volume fraction of fiber

DEFORMATION AND FAILURE OF SUGARCANE BAGASSE REINFORCED PP

Juliana Anggono[1], Ágnes Elvira Farkas[2,3], András Bartos[2,3], János Móczó[2,3,*], Antoni[4], Hariyati Purwaningsih[5], Béla Pukánszky[2,3]

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ABSTRACT

Polypropylene composites were prepared from sugarcane bagasse fibers by extrusion and injection molding. Wood flour was used as reference filler in the study. The fiber content of the composites changed between 0 and 30 wt% in 5 wt% steps. Maleated polypropylene was used as coupling agent to improve interfacial adhesion. Mechanical properties were characterized by tensile and fracture testing, while local deformation processes were followed by acoustic emission and instrumented impact testing, as well as by the analysis of scanning electron micrographs. The results showed that sugarcane bagasse fibers reinforce polypropylene similarly to other natural fibers. They increases stiffness, but decrease tensile yield stress, tensile strength and deformability. Increased interfacial adhesion leads to the considerable improvement of reinforcement. Bagasse fiber and wood flour filled composites have very similar properties. The impact resistance of the composites increased in the presence of both fibers compared to the neat matrix. Debonding is the dominating process in the absence of the coupling agent, while mainly fiber fracture occurs in its presence. Increased plastic deformation after debonding results in slightly improved impact resistance.

Appendix 4. Draft Patent

Deskripsi

METODE PEMBUATAN SERAT PENGUAT BIOKOMPOSIT DARI AMPAS TEBU

Bidang Teknik Invensi

Invensi ini berkaitan dengan metode pembuatan serat penguat dari ampas tebu (*sugarcane bagasse*) untuk untuk pembuatan biokomposit dengan polimer sebagai bahan matrik.

Latar Belakang Invensi

Proses merserisasi merupakan proses perlakuan kimia menggunakan larutan sodium hidroksida (NaOH) yang sudah umum diterapkan dalam industri, khususnya industri tekstil. Efek larutan sodium hidroksida pada kapas ditemukan pada tahun 1844 oleh John Mercer, seorang *calico printer* Inggris, yang menerima paten untuk itu pada tahun 1850. Proses ini diterapkan pada serat kapas atau kain dengan tujuan meningkatkan afinitas serat kapas pada pewarna secara permanen, meningkatkan kekuatan tarik, daya serap, serta tingkat kilau yang tinggi (dikutip tanggal 2 Agustus 2018 dari https://www.britannica.com/technology/mercerization) Proses merserisasi terdiri dari merendam benang atau serat dalam larutan natrium hidroksida (soda kaustik) dalam waktu singkat, biasanya kurang dari empat menit. Bahan kemudian diolah lanjut dengan air atau asam untuk menetralisir sodium hidroksida.

Seiring dengan meningkatnya kesadaran lingkungan baik dari industri maupun publik, serta didorong oleh faktor ekonomi, minat terhadap biokomposit polimer dengan bahan penguat dari serat alam mengalami peningkatan selama dekade terakhir ini.