PDF-Export

Topic:

Polymers from renewable resources. Bio-natural Adhesives

Paper-ID	85276
Paper title	Flexural strength of mechanical wood fiber reinforced bio-based polyamide 11 composites and its comparison with glass fiber reinforced polypropylene composites
Presentation format	Oral presentation
Date of submission	28.02.2017 14:38 Uhr

Authors

- Helena Oliver-Ortega *(helena.oliver@udg.edu)* (Presenter)
- Francesc Xavier Espinach *(francisco.espinach@udg.edu)*
- Josep Claramunt *(josep.claramunt@upc.edu)*
- Fernando Julian *(fernando.julian@udg.edu)*
- José Alberto Méndez *(jalberto.mendez@udg.edu)*
- Pere Mutjé *(pere.mutje@udg.edu)*
- Mònica Ardanuy *(monica.ardanuy@upc.edu)*

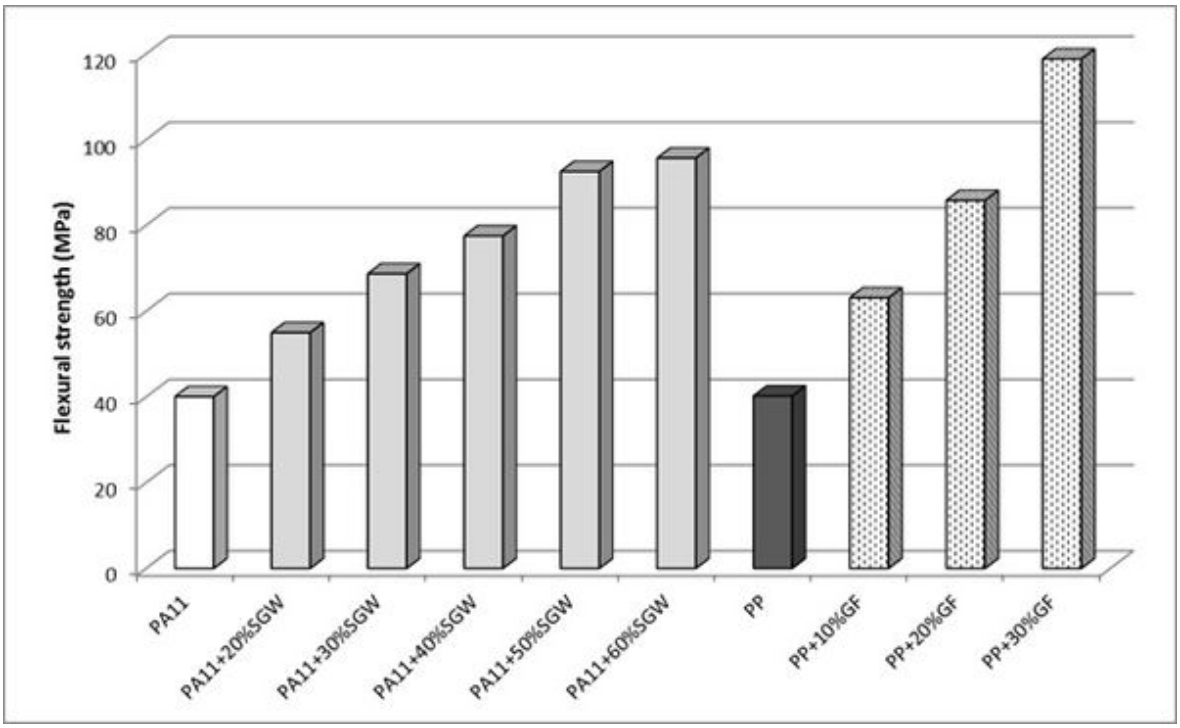
Content

The environmental awareness of society has led the research in materials science towards the production of bio-based and biodegradable materials. In the composite materials field, common reinforcing materials had been replaced successfully by greener reinforcements. In that sense, the case of glass fibres which are replaced by lignocellulosic fibres, and have nowadays applications in large industries: automotive, aerospace, clinical [1-4], is a clear example. Furthermore, in the recent years, an increasing effort to produce totally bio-based composites is underway in research centres and industries, replacing oil-based matrices by totally or almost totally bio-based matrices. Polyamide 11 (PA11) is one of these promising examples of bio-based matrices [5-7].

PA11 is a totally bio-based polyamide obtained from castor oil and commercially available which had a good chemical resistance, biocompatibility and could be recycled. Moreover, their lower melting point compared with other polyamides allows it to be reinforced with lignocellulosic or cellulosic fibres with low or inexistent thermal fibre degradation.

Bio-composites from PA11 and lignocellulosic or cellulosic fibres had shown high tensile properties in the literature without the use a coupling agent. However, to the author's best knowledge, there is a lack of studies about the flexural properties of such PA11-based composites. In these work, flexural properties of PA11 and stone groundwood fibres (SGW) composites were analysed and compared with those of polypropylene reinforced with glass fibre (PP-GF) as a more sustainable material.

Figure 1: Behavior of the flexural strength of the PA11/SGW and the PP/GF composites against reinforcement contents and comparison with the PA11 and PP matrices'.



Paper-ID	47616
Paper title	Formulation of a hybrid organic-inorganic matrix coating for the protection of wood
Presentation format	Poster
Date of submission	30.01.2017 13:52 Uhr
Authors	- Pedro Luis de Hoyos Martinez *(pedroluis.dehoyos@ehu.eus)* (Presenter) - Jalel Labidi *(jalel.labidi@ehu.eus)* - Fatima Charrier – El Bouhtoury *(fatima.charrier@univ-pau.fr)*

Content

Solid Wood and wood based products are playing a major role in buildings and interior fittings due to their structural, mechanical and environmental properties. They present though the disadvantage of having a high vulnerability against fire. For this reason, the market is asking for new fire retardant, due to environmental, safety and health reasons [1]. In this context the design of a new generation fireproofing treatment for solid wood or based related products is a major issue. Several methods have been implemented over the years. Among them, the use of flame retardant substances and their application into fireproofing coatings has resulted to be the more convenient and efficient. Besides the addition of nanoscale additives, such as silicates, proved to entrust synergistic behaviour to the intumescent compositions [2].

Lignocellulosic materials have become a great economic issue in the context of the biorefinery as a source of biofuels and raw materials for the replacement for fossil resources. Among lignocellulosic products, there are polyphenolic compounds such as tannins and lignin which are respectively by products of the wood and pulp industries. Lignin is a complex macromolecule whose structure and properties are highly dependent on the extraction method and this influences its application and valorization [3] . Therefore, a deep understanding is needed, in order turn around the current tendency of its underutilisation. Concerning tannins, they are nontoxic flavonoid molecules, which are mainly used for manufacturing various kinds of adhesive resins used in the production of panels and particleboards [4].

Thereby the aim of this work is the production of a hybrid organic-inorganic matrix composed of a green phenol-formaldehyde (PF) resin and silicates nanoaditives, which can be used as fireproofing coating for wood. The resin used is lignin and tannin derived. The lignin employed is organosolv type, what entrusts low molecular weights and sufficient activity for the polymerisation. Several commercial tannins are tested too. The utilisation of polyhedral oligomeric silesquioxane (POSS) and montmorillonite as silicate based nanoadditives is assessed as well. The best formulation will be elucidated after thorough analysis of the components and performance.

1. Seo, H. J., Kim, S. 2016. Enhancing the flame-retardant performance of wood-based materials using carbon-based materials. J. Therm Ana Cal., 123, 1935-1942

2. Gilman J.W., Jackson C.L. 2000. Flammability properties of polymer-silicate nano-composites: PP and PS nano-composites, Chem. Mater 12:1866

3. Lora, J.H., Glasser W.G. 2002. Recent industrial applications of lignin: a sustainable alternative to non-renewable materials. J. Polym Env., 10: 39-48

4. Pizzi, A., Mittal, K.L., 2003. Handbook of Adhesive Technology, 2nd ed., revised and expanded. Marcel Dekker, New York

Paper-ID	25761
Paper title	Production of film paper with antimicrobial activity from coir fiber
Presentation format	Poster
Date of submission	23.01.2017 18:15 Uhr
Authors	- Andreia Morandim-Giannetti *(andreia.morandim@gmail.com)* (Presenter) - Andressa Carolina de Almeida *(andressa_carolina@me.com)* - Camila Machado *(cd836814@ohio.edu)* - Daniella Coelho *(daniella.oc@outlook.com)* - José Carlos de Andrade Neto *(josebln@outlook.com)* - Najib Mourad *(najib__mourad@hotmail.com)* - Natália Teixeira *(nataliast123@hotmail.com)*

Content

The coconut fiber is a lignocellulosic waste found in abundance; however, it normally is not reused, even though it is an important cellulose source. In this context, within the possible applications of cellulose that comes from this waste, bioethanol, composites and biodegradable plastics such as cellulose acetate antimicrobial films are highlighted. Therefore, knowing the importance of the application of this material in processes, this work had as objective the purification of coconut cellulose fiber with the aim of production of antimicrobial film. This is one of the major challenges for food industry that has developed several researches in searching new packages that allow the extension of foods' life cycle. With this intention, the process was initiated with the fiber's milling, followed by pulping and whitening, that together resulted in a deslignification of 66.37%. There was also accomplished the synthesis and characterization of the ionic liquid n-butylammonium acetate, that was proved to be the right one by nuclear magnetic resonance (NMR) analysis. With the ionic liquid, the treatment of coconut fiber followed by whitening was fulfilled resulting in a deslignification of 0.82 and 6.10%, respectively. After this, the esterification was accomplished generating cellulose triacetate, that was characterized by Infrared Spectroscopy, Scanning Electron Microscope (SEM), X-Ray Diffraction (XRD) and Degree of Substitution. Those methods gave similar results, because the surface, crystallinity and characteristics bands are similar in the triacetates produced by all the three materials. This means that when producing cellulose triacetate, the deslignification treatment is not needed. Subsequently, the film with lemon grass's essential oil was obtained, and the antimicrobial activity was analyzed in a qualitive way. The results were promissory because after putting a certain type of food in contact with the film, there was not any visible proliferation of microorganisms.

Paper-ID	26446
Paper title	Properties of lignin resulting from bioethanol production using olive tree pruning biomass
Presentation format	Poster
Date of submission	24.01.2017 13:12 Uhr

Authors

- Eulogio Castro *(ecastro@ujaen.es)* (Presenter)
- Encarnación Ruiz-Ramos *(eruiz@ujaen.es)*
- Inmaculada Romero *(iromero@ujaen.es)*
- Manuel J. Diaz *(mjdiaz@ujaen.es)*
- Xabier Erdocia *(Xabier.erdocia@ehu.eus)*
- Jalel Labidi *(Jalel.labidi@ehu.eus)*

Content

Biomass generated from pruning of olive trees constitutes one of the main renewable agricultural residues in Mediterranean countries. More than 2.5 million hectares of olive trees are cultivated in Spain, with an average biomass generation of 2 tons per hectare.

This lignocellulosic material has been proposed for bioethanol production by means of a process including pretreatment, enzymatic hydrolysis, and fermentation. After the fermentation step, the remaining material is composed mainly by lignin, which is altered only till a limited extent during the process.

This work describes the characteristics of lignin obtained from olive tree pruning biomass pretreated by steam explosion at 210ºC for 5 min. The pretreated solids were further enzymatically hydrolyzed with 15 FPU/g substrate Cellic cTec2 supplemented with β-glucosidase, (Novozymes) at 5% substrate concentration. The resulting solid residue was dried and characterized by FTIR, pyrolysis-GC/MS and GPC.

The chemical characterization showed that the solid is manly formed by lignin with some impurities (ashes and sugars: glucose and xylose). The molecular weight of extracted lignin is comparable to organosolv lignins. However, the polydispersity index (Mw/Mn) is very high indicating many different molecular weight fractions inside the samples. The obtained lignin could be used for the development of added value products (materials, building blocks, additives…).

Acknowledgments

The authors are grateful to Spanish Ministerio de Economía y Competitividad for financing this research (Ref. ENE2014-60090-C2-2-R).

Paper-ID	30681
Paper title	Synthesis of new product based on esterified lignin and its different applications
Presentation format	Poster
Date of submission	26.01.2017 16:29 Uhr
Authors	- OIHANA GORDOBIL *(ogordobil002@gmail.com)* (Presenter)

Content

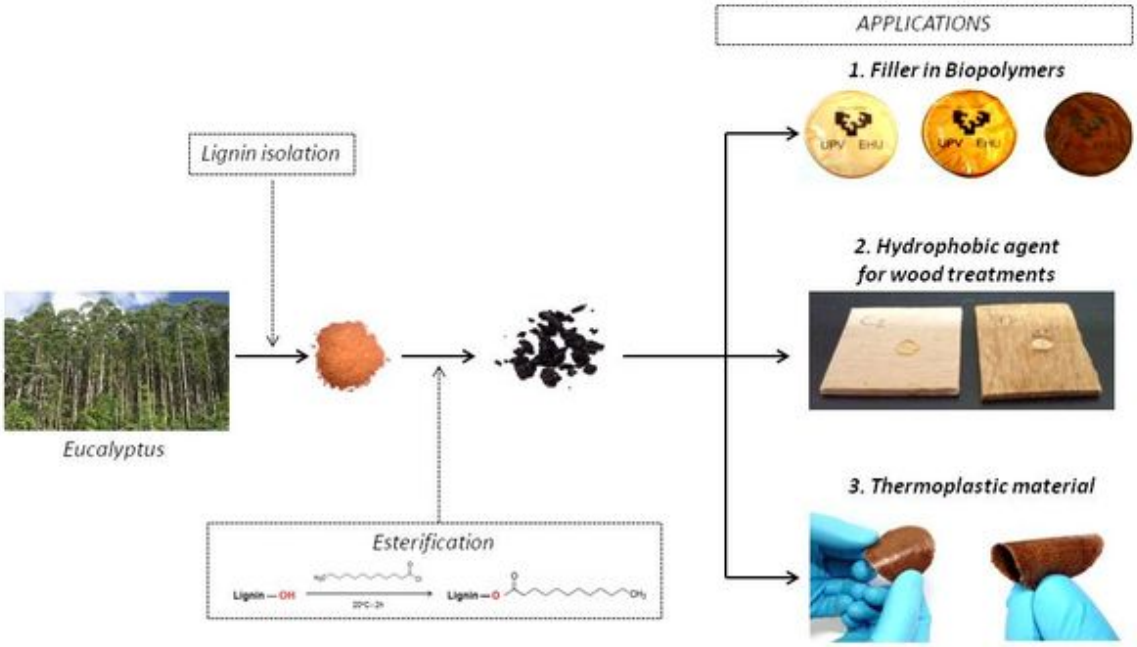
Paper-ID	32231
Paper title	Synthesis of new product based on esterified lignin and its different applications
Presentation format	Poster
Date of submission	27.01.2017 10:09 Uhr
Authors	- OIHANA GORDOBIL *(ogordobil002@gmail.com)* (Presenter) - EDUARDO ROBLES *(robles.edu84@gmail.com)* - RENE HERRERA *(reneherdiaz@hotmail.com)* - JALEL LABIDI *(jalel.labidi@ehu.eus)*

Content

Lignin, one of the main structural components of lignocellulosic biomass and the second most abundant macromolecule in nature, can be a good raw material to replace non-renewable sources. The conversion of lignin into value-added products is an essential part of the integrated biorefinery concept. Its complex structure based on three phenylpropane units linked to each other via ether and C-C bonds and substituted with various functional groups among which phenolic and aliphatic hydroxyl groups are which present the highest potential as reactive point for chemical modifications [1]. The esterification, one of the easiest chemical reactions to perform considering the reaction parameters and used reactants, allows the change of some of the original properties of lignin, such as increasing its hydrophobicity as well as its solubility in organic solvents. Moreover, when lignin is modified by esterification, hydroxyl groups are functionalized by ester substituents, thus reducing the number of hydrogen bonds, leading to an increase of the free volume in the molecule and providing greater mobility of the chains. It has an important influence on the thermal behavior of the lignin molecule decreasing the glass transition temperature (Tg) [2]. This study was focused on the isolation of lignin from Eucalyptus by organosolv process (OE) and the synthesis of lignin-ester derivatives using a long aliphatic chain (12 carbons) in order to change some of its original properties such as solubility, hydrophobicity, thermal behavior and its compatibility with other biopolymers. The main objective of this work was the analysis of the possible applications of the elaborated new product as show Figure 1.

[1] S. Laurichesse, L. Avérous, Chemical modification of lignins: towards biobased polymers, Prog. Polym. Sci. 39 (2014) 1266-1290.

[2]N. Cachet, S. Camy, B. Benjelloun-Mlayah, J. Condoret, M. Delmas, Esterification of organosolv lignin under supercritical conditions, Ind. Crop.Prod. 58 (2014) 287



Paper-ID	85451
Paper title	Use of residual cotton fibers to prepare composite materials. An analysis of the interphase.
Presentation format	Oral presentation
Date of submission	28.02.2017 14:57 Uhr

Authors

- Albert Serra *(bertu.serrin@gmail.com)*
- Helena Oliver-Ortega *(helena.oliver@udg.edu)* (Presenter)
- Quim Tarrés *(joaquimagusti.tarres@udg.edu)*
- Fernando Julian *(fernando.julian@udg.edu)*
- Pere Mutjé *(pere.mutje@udg.edu)*
- Mònica Ardanuy *(monica.ardanuy@upc.edu)*
- Francesc Xavier Espinach *(francisco.espinach@udg.edu)*

Content

Virgin cotton strands are yarned to manufacture spinning. These spinning are used to manufacture textiles. The manufacturing process produces byproducts in the shape of fabric trims that are submitted to a defibration process, obtaining cotton fibers [1, 2]. Anyhow, some of those fibers have length less than 10mm, and are unable to be yarned. This byproduct has the shape of a fluff made of short tinted cotton fibers. Some of the samples were faded. The tinted and the faded fibers were chemically analyzed and it was found that they contained a high amount of cellulose. This s contents and the hydrophilic nature of the natural fibers presuppose that the interphase between the fibers and the hydrophobic polyolefin will be of low quality. In such cases, adding low (2 to 6%) of coupling agent (MAPP) showed a high effect on the quality of the interphase. Batches of 30 and 40% w/w cotton fibers reinforced polypropylene were prepared. MAPP contents in the range between 0 to 8% w/w against the fiber content were prepared and tensile tested. It was found that until with a 0% MAPP content the tensile strength of the composite materials increased noticeably. This behavior was unexpected, as usually, a small increase or even a decrease of its tensile strength was expected [3, 4]. The inclusion of MAPP further increased the tensile strength of the composites. It was found that a 6% w/w MAPP rendered the highest tensile strength.

The behavior of the tensile strength of the composites without MAPP content revealed that the interphase between the cotton fibers and the PP was better than the expected. Thus, it was suspected that the 0% MAPP contents showed a good wetting of the fibers. It could be possible if the hydrophilic nature of the fibers is reduced or disabled. The only difference between virgin cotton fibers and the recycled cotton fibers is the presence of tint chemicals. It was found that these chemicals decreased the hydrophobicity of the cotton fibers. Nonetheless, the researchers suspected that these tint chemicals also disabled part of the MAPP effects on the tensile strength of the composites, avoiding the creation of all the possible chemical links between the MAPP and the OH groups. To further deep in the quality of the interphases, a micromechanics analysis was performed. The intrinsic tensile strength of the cotton fibers was obtained experimentally. The modified Kelly and Tyson model (KT) was used to assess the quality of the interphase [5]. In the case of the composites with 6% of MAPP, the value of the interfacial shear strength was computed by the Von Mises criteria. Then, the orientation factors were found. The factors were in line with previous researches, and considered correct. Such factors were used in the case of the composites without MAPP to obtain its interfacial shear strength, being lower than that of the composites containing MAPP.