In this study, polypropylene (PP) /wood flour (WF) composites were prepared at three different target densities (1.0, 1.1, and 1.2 kg/m3) by using MAPP or silane as coupling agent at a WF content of 50%. The loading levels of coupling agent were set at 2.0 wt% based on the total weight of PP and WF. The compression stress relaxation curves of the composites were tested at three temperatures of 20, 40, and 60°C. The stress relaxation rates were calculated to show the effects of density on long-term dimensional stability at different temperatures. The apparent activation energy was further calculated to compare the interface compatibility between PP and WF in the composites with different density. The flexural modulus of rupture (MOR) and modulus of elasticity (MOE) were also tested to compare with the stress relaxation results. The results showed that: (1) with the increasing density, the rate of stress relaxation decreased for PP/WF composites either by using MAPP or silane as coupling agent at all three temperatures, suggesting a better long-term dimensional stability at higher density, which was consistent with the trend of flexural properties; (2) the apparent activation energy of the composites increased almost linearly with the density, which indicated that the internal compatibility between PP and WF could be improved corresponding to the increase of density; (3) the effect of temperature on stress relaxation highly depended on the type of coupling agent although stress always relaxed more rapidly at higher temperatures. MAPP modified PP/WF composites seem more temperature-tolerant by showing close relaxation curves at 20 and 40 °C, but silane modified composites are more temperature-sensitive with much faster stress relaxation at 40 °C than 20 °C. Therefore, at tropical areas MAPP would be a better choice than silane for application in PP/WF composites.

Keywords: polypropylene /wood flour composites, density, stress relaxation, coupling agent, temperature

PP143

Tannin from grape pomace: extraction and utilization as adhesive for wood particleboard

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Grape is one of the most harvested fruit in the world, with more than 65 million of tons produced in 2009. A large part is used for the wine production which created a large amount of wastes. The pomace represents 20% of the bunch and is currently used as source of ethanol, tartaric acid and polyphenols in distilleries. However, huge quantities of materials still remain after those valorizations (about 700 000 tons per year of dry material just for France). The residue is generally used for animal feed or fertilization, without any economical interest and potential negative effects due to the high polyphenolic content.

Grape pomace is composed for an important part of condensed tannins, other polyphenols and free sugars. For many years, condensed tannins from barks of trees such as Mimosa or Pine are industrially extracted and used as adhesives for wood-based materials. The extraction process used for the grape pomace is inspired by the bark extraction: in warm water with sodium hydroxide, sodium carbonate or sodium hydrogenocarbonate in presence of sodium sulfite.

Since extracted tannins have shown a good reactivity toward formaldehyde, wood particleboard had been made in a laboratory scale with a resin composed by 80% of condensed tannin, 16% polymeric methylene diphenylene diisocyanate (pMDI) and 4% paraformaldehyde. Its internal bond value was good enough to pass the international standard specificationfor interior grade panel.

Keywords: Condensed tannins, adhesives, grape pomace, extraction

PP144

Effect of Using Delignified Fibers on Mechanical Properties of High Density Polyethylene Composite Filled with Bagasse Before and After Accelerated Weathering

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There is great potential for wood plastic composites usage for outdoor applications in the markets. However these products contain natural fibers which go through degradation due to various environmental factors, and that also increase the photo-degradation of polymer matrix. Loss in mechanical properties is one of the undesirable effects of these degradation which by itself can limit structural application of WPCs. Lignin plays an important role in the field of wood weathering.

In this study, lignin was partially removed from non-wooden fibers of sugar cane (bagasse). These fibers were applied with high density polyethylene to produce natural fiber composites. Granule polyethylene based pigments were also added to half of the samples. To investigate the effects of delignification and pigments on mechanical properties of produced composites before and after 1440h accelerated weathering, three different mechanical tests were conducted: 3 points bending, vibration test and indentation. These tests were carried out on the samples to obtain the best index for measuring the effect of weathering on samples, and also assess to the changes in MOE, work of maximum load and ductility after exposure to weathering. As well, ATR-FTIR spectroscopy has been applied to explain the chemical changes according to the mechanical ones.

An undeniable loss in MOE was observed as the result of using delignified fibers in WPCs. Before any exposure to weathering, interaction of delignified fibres and pigments showed high reduction in MOE. After weathering, the MOE systematically decreased. However, for delignified samples containing pigments minimal change in the MOE was observed. By means of FTIR analysis, delignified samples showed increase in oxidation of surface and produced high amount of carbonyl group after weathering. Also, colored samples showed less decrease in lignin and carbonyl indexes, while they lost more hydroxyl and wood indexes compared to the control samples. These results indicate the role of pigments as reducer of oxidation. Cooperation of delignified fibres with pigments show interesting increase in crystallization of the product after weathering.

Keywords: Photo-degradation; 3 points bending; Vibration test; Indentation; FTIR spectroscopy; Pigment

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