

## **Mechanical and thermal characterization of polyester composite containing treated wood flour from Palm oil biomass**

### **Abstract**

The effect of water and alkali treatment on the thermal decomposition of oil palm shell (OPS) together with the mechanical performance of polyester composites reinforced with treated OPS has been presented in this work. Treatment of OPS with cold/hot distilled water and cold alkali treatment were found to improve the tensile and flexural strength of the resulting composites although the highest mechanical performance was noted with the use of sonication in hot distilled water. On the other hand, hot alkali treatment was found to produce a composite mechanical performance similar to that of the hot distilled water treatment with sonication. FTIR tests indicated that adsorbed water molecules together with some parts of the hemicellulose and lignin were removed by the treatments. Thermogravimetric analysis and scanning electron microscopy of the treated OPS with hot alkali (1–9% concentration) showed that the mechanical performance reach a peak at 7% alkali concentration with a further increase in concentration resulting in a significant lignin mass loss and decrease in mass residue of the OPS. This trend was attributed to the higher alkali concentration removing hemicellulose as a binder for the cellulose and lignin which resulted in debonding between the filler and matrix components of the OPS and hence a deterioration in fiber structure and resulting poor composite mechanical performance. Therefore, it was concluded that the optimum concentration of alkali treatment required for maximum mechanical performance of natural filler reinforced polymer composites can be obtained simply from thermogravimetric analysis. POLYM. COMPOS., 2016. © 2016 Society of Plastics Engineers