Conference Proceedings Volume 2703, AIP Conference Proceedings

Effect of Carbonized Coconut Shell as a Filler on Tensile Properties and Water Absorptivity of HDPE Composite

Abstract

Generation of agricultural wastes have detrimental effect to our surrounding especially visual impacts and inefficient land use. Some of these wastes are natural fibers which can be used as potential filler in composite materials. In this study, carbonized coconut shell (CCS) had been utilized as filler and it was incorporated in the high density polyethylene (HDPE) matrix to develop carbonized coconut shell filled HDPE composites. Firstly, the coconut shell powder was treated by sodium hydroxide (NaOH) with the concentration of 1, 3, 5 and 7 wt% for 2 hours. The 7 wt% treated coconut shell revealed better filler properties in the proximate analysis. Next, it was converted into carbonized coconut shell via carbonization process at 600 °C and used as filler in HDPE composites. The carbonized coconut shell filled HDPE composites with different filler loading of 5 to 20 wt% were prepared using extruder at operating conditions of 180 °C at 70 rpm of screw speed. The increase in the filler loading enhanced the tensile strength and the Young's modulus of the filled HDPE composite. However, the elongation at break of the composite was observed to decrease with an increasing in the filler loading. There are some voids observed in the HDPE/CCS5 composites while good surface adhesion was presented in HDPE/CCS15 composites. The water uptake by the composites was observed to be increased with the filler loading. In conclusion, the optimum filler loading for carbonized coconut shell filled HDPE composites was determined as 15 wt% because it imparts high tensile strength with moderate water absorption properties.