

The Influence of Surface Modification Using Low-Pressure Plasma Treatment on PE-LLD/ α -Cellulose Composite Properties

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The use of plant source-based stiff fillers as reinforcement of polymer composite systems have attracted significant interests of researchers during last few decades. Unlike synthetic fibres, plant fibres are renewable, carbon neutral, biodegradable, non-petroleum based, and have low environmental, human health and safety risks. Moreover plant fibres have potential to reduce weight of composite parts up to 40% compared to the traditional synthetic composite reinforcement like glass fibres. The main disadvantage of plant fibres lies in combination of non-polar polymer matrix (hydrophobic) and polar plant fibres (hydrophilic). This combination creates poor interface with low adhesion of both components. That implies poor wettability of fibres by polymer matrix and low mechanical properties of composites. To improve the compatibility various methods have been explored to increase the hydrophobicity of plant fibres. The most used method is chemical surface treatments of fibres with large quantities of hazardous chemicals that are usually involved in the process. Therefore more greener sustainable technology, that is environmentally friendlier and industrially scalable was investigated in this paper. The process based on low-pressure plasma treatment of both fibres (α -cellulose) and matrix (PE-LLD) was implemented in processing of composites by twin screw extrusion and injection moulding. Resulted composites were characterized by means of scanning electron microscopy (SEM), thermal and mechanical testing.

Keywords: Polymer composite, Plasma treatment, Lightweight, Surface modification, Cellulose

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