MECHANICAL ANALYSIS OF PLASMA TREATED COCONUT FIBER MATS REINFORCED UNSATURATED POLYESTER BIOCOMPOSITE

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Abstract: Concern about environment issues and waste disposal has led industries, governments, researches and population to develop, manufacture and appreciate more environmental friendly alternative materials based on global environmental factors such as eco-efficiency, sustainability, industrial ecology and greener chemistry and engineering. From this sustainable point of view, the use of natural fibers in polymer composites is emerging as a viable alternative to synthetic fibers presenting advantages such as weight saving, lower cost, sustainability, recyclability and biodegradability. On the other hand, natural fiber – polymer matrix interface is the shortcoming of a polymer composite, featuring poor interfacial adhesion and affecting its mechanical properties. However, the fibers properties and its adhesion to the polymer matrix could be improved by surface treatments. Therefore, usual chemical treatments, although enhance adhesion properties, uses chemical reagents and generates toxic liquid waste presenting a negative environmental impact. Atmospheric plasma treatment has the potential to increase coconut fibers roughness and activate their surface, besides increasing adhesion to the polymer matrix without generating liquid waste. This work involves the manufacturing of a biocomposite using raw materials from renewable sources and processes with sustainability and environmental friendly characteristics besides their mechanical characterization. Unsaturated polyester resin, which employs raw materials from renewable sources and reused thermoplastic resins, reinforced with untreated and plasma treated coconut fiber mats were manufactured by resin transfer moulding. Mechanical tests were performed in order to compare tensile and flexural properties of untreated and plasma treated coconut fiber mats reinforced biocomposites. Experimental data indicated that atmospheric plasma treatment enhances interface adhesion properties improving mechanical properties of the coconut reinforced unsaturated polyester biocomposites.

Keywords: Sustainability, Biocomposite, Unsaturated polyester, Coconut fiber, Plasma, Mechanical properties