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ENVIRONMENTAL FRIENDLY MATERIALS FOR LIGHTWEIGHT STRUCTURAL COMPONENTS

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The stringent environmental rules and depletion in crude petroleum oil has increased the awareness among the investigators around the globe for the utilization of more biodegradable materials derived from renewable sources which provide an more environmental friendly and sustainable characteristic option in the polymeric matrix based biocomposite material field. The biocomposites are of three types namely: natural fiber and bio based matrix type, natural fibers and synthetic matrix type, and synthetic fiber and bio based matrix type. Out of these three types, the first type comprising of bio matrix and fibre type which is popularly termed as "green composite" is finding increased use in the field of construction, autumotive and aerospace, sports sectors to name a few. The synthetic polymers which were widely used for so many years are now being substitued with eco-friendly bio-polymers. Over the years, the reduction in the price and abudant availability of biopolymers (polylactic acid, starch blends and polyhydroxyalkanoates etc.) has increased their use in natural fiber composite material system. Some of the demerits of these polymers are their hydrophilic nature, poor mechanical and thermal properties. The above said limitations can be overcome by combining these polymers with other polymers as well as reinforcing them with fibers or filler materials. The natural fibers due to their eco-friendly properties like renewability, non-toxic behaviour, good thermal behaviour and low cost when used as reinforcing agent in polymeric matrices has helped in the development of biodegradable fiber reinforced composite material system. The fiber reinforced composites mainly constitutes of micro fibers randomly distributed in polymer system. The other importnat factor that decides the quality of composites are the mechanical interlocking behviour between the fiber and matrix material which plays a significant role in load distribution capability of the composites. The most widely used technique to improve the

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adhesion property between the fiber and matrix is found to be chemical treatment method which would modify the surface of the fibers to functionalize it to be perfectly reinforced in polymer matrix and there by enhancing the mechanical strength of the composite material. Some of the chemical treatment methods that are used are alkaline, silane, benzoyl peroxide, potassium permanganate, stearic acid treatments etc. The composites can be further developed to produce lighter materials by improving their specific properties. The lightweight biocomposites can be obtained by foaming the polymer matrix. In this sight, the researchers are now developing various foaming techniques for polymers. The need for greener technology has made the researchers to foam the polymers by using CO_2 gas which has low environmental impact due to its eco-friendliness, inertnesss, non-toxic and non-flammable properties. Therefore if some of the challenges such as obtaining better interfacial adhesion between fiber and matrix and foaming of biopolymer matrices are resolved, the biocomposites can be succesfully used in the development of various lightweight structural components.

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