

Environmental and Sustainable Biocomposite Materials Applications and Properties

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Abstract- Many well-known material structures, such as metals, ceramics or polymers, cannot meet all the technological demands. For this reason, there is ongoing research into new materials with advanced features. A composite material is consisting of at least two phases, which has a balance of structural properties that is superior to either constituent material alone. The composite material usually consists of two components, the matrix and the filler. Composites, metal matrix composites (MMCs), ceramic matrix composites (CMC) or polymer matrix composites (PMCs). The matrix in PMCs might be made of thermoset, elastomer or thermoplastic polymers. Regarding dispersed phase composite materials might be distinguished into, particle reinforced composites, dispersion reinforced composites, fiber reinforced composites, structural composites. Among various possible types of polymer composite materials, the most important ones are biocomposites that are recently of great interest due to their unique properties. Recently, the fundamental role in replacing conventional polymer composites in various application is played by composites produced with renewable resource materials. Polymer composites, in which at least one component is biobased or biodegradable, are called biocomposites.

The fundamental benefits from application of biocomposites as alternative material for fossil-based products are among others: prevention of an imbalance of supply and demand of products manufactured from non-renewable fossil raw materials, sustainable waste management, carbon emission reduction, biodegradability of materials or facilitated recycling process and a positive impact on agriculture. Waste disposal is becoming increasingly important with the recognition that landfill is not sustainable and as such costs are increasing, with more responsibility being placed on producers. Such drivers are regulations-based and the governments of a number of countries have established laws to encourage the use of recycled or bio-based 'green' products. A wide range of natural fibres exist and they can be classified into three main groups – plant, animal and mineral. The fibers serve as reinforcement by giving strength and stiffness to the structure while the polymer matrix holds the fibers in place so that suitable structural composites can be made. Main physico-mechanical properties of natural fibers and biopolymers are presented. Modulus of elasticity and tensile strength increased with rising content of natural fibers in composite. These biobased materials might have great potential for their use in packaging, automobile applications, insulations and construction industries. As a result of growing environment and health hazard and problems connected with exhaustion of renewable natural resources, a concept of sustainable development has become one of the main priorities for the World Source. In this study, the area of usage, purposes, manufacturing methods, physical, mechanical and microstructural properties of biocomposite materials were reviewed.

Keywords- biocomposites, environmental impact, sustainable development, physico-mechanical properties