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Characterization of Biocomposites Based on Mussel Shell Wastes

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Abstract : Shell wastes represent a considerable quantity of byproducts in the shellfish aquaculture. From the viewpoint of ecofriendly and economical disposal, it is highly desirable to convert these residues into high value-added products for industrial applications. So far, the utilization of shell wastes was confined at relatively lower levels, e.g. wastewater decontaminant, soil conditioner, fertilizer constituent, feed additive and liming agent. Shell wastes consist of calcium carbonate and organic matrices, with the former accounting for 95-99% by weight. Being the richest source of biogenic CaCO₃, shell wastes are suitable to prepare high purity CaCO₃ powders, which have been extensively applied in various industrial products, such as paper, rubber, paints and pharmaceuticals. Furthermore, the shell waste could be further processed to be the filler of polymer composites. This paper presents a study on the potential use of mussel shell waste as biofiller to produce the composite materials with different epoxy matrices, such as bisphenol-A type, CTBN modified and polyurethane modified epoxy resins. Morphology and mechanical properties of shell particles reinforced epoxy composites were evaluated to assess the possibility of using it as a new material. The effects of shell particle content on the mechanical properties of the composites were investigated. It was shown that in all composites, the tensile strength and Young's modulus values increase with the increase of mussel shell particles content from 10 wt% to 50 wt%, while the elongation at break decreased, compared to pure epoxy resin. The highest Young's modulus values were determined for bisphenol-A type epoxy composites.

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