

## **Microcrystalline Cellulose Based Polymer Composite for Engineering Applications**

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In the last several years, polymer composites have been used heavily in aerospace, automotive and other engineering applications. Polymer matrix composites (PMCs) are comprised of a variety of short or continuous fibers bound together by an organic polymer matrix. Natural fibers are recently getting attention from researchers and academia to utilize in polymer composites due to their eco-friendly nature and sustainability. Cellulose is the most abundant and renewable biopolymer on earth and is obtained from renewable resources such as biomass. Microcrystalline cellulose (MCC) is a member of cellulose family. MCC possesses many advantages compared to cellulose fibers. Polypropylene is one of the widely used thermoplastic material as matrix material in engineering applications. In this research, Polypropylene matrix with microcrystalline cellulose reinforced composite was investigated for their mechanical properties.

MCC was subjected to surface modification to improve compatibility with hydrophobic Polypropylene using silane treatment. Polypropylene was mixed with surface treated MCC by varying MCC concentration (1% wt. to 5% wt.) in a laboratory type internal mixer. Composite was fabricated using compression moulding technique. Impact, tensile, hardness and water absorption tests were performed to evaluate the mechanical properties of the developed composites. Density of the developed composite was measured to estimate the weight of the developed composite.

Experimental results showed that gradual increase of tensile strength, hardness and impact strength with the increase of MCC concentration. Polypropylene with 4 wt% of MCC. sample showed the maximum impact strength and it was  $18.2 \text{ KJ/m}^2$ . Maximum water absorption (0.02%) was observed in 5wt%. MCC containing sample. 5wt%.MCC containing sample showed a maximum hardness (74.5 Shore D). Developed composite showed the gradual reduction of density from 1wt% MCC ( $0.880 \text{ g/cm}^3$ ) to 5wt% MCC ( $0.825 \text{ g/cm}^3$ ). Therefore, Polypropylene with MCC polymer composite can be used for different engineering application. This provides light weight benefits.