G08.26

Interfacial Shear Strength in GF/PP Injection Molded Composites

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Polypropylene (PP) is cost effective with high throughput, which has not only increased the demand of injection molded parts, but also propelled large quantities of discarded materials. Recycling is one of the options being explored. Thus, utilization of recycled material attracts attention. During recycling, the material is subjected to thermo-mechanical forces that induce several modifications in the molecular structure. The properties of polymeric materials are mainly dependent on the molecular structure; hence the physical properties of recycled products could be quite different from those of the virgin material. Ultimately, it is necessary to pay particular attention to the changes in structural and physical changes that emerge due to recycling. We have suggested incorporation of reinforcement or filler which can essentially enhance the mechanical properties of the recycled PP. It is well established that the molecular weight of recycled PP decreases significantly as compared to the virgin material. Hence this study involved 3 grades of PP with different molecular weights in order to simulate the recycling process. In glass fiber (GF) reinforced PP, the interfacial adhesion between PP and GF is relatively weak. The integrity of the fiber-matrix interface is vital in determining the mechanical performance of composite materials. Interactions between glass and PP are weak because the glass has polar surface while PP is non-polar polyolefin. Adequate adhesion between the fibers and matrix results in efficient stress transfer from the matrix to the reinforcement. Adhesion is promoted by modifying the surface of the glass fibers with appropriate sizing. In the case of GF/PP composites, the addition of functionalized PP e.g. PP grafted maleic anhydride (PP-g-MAh) can generate improved interface PP-g-MAh is used to enhance interfacial adhesion that leads to remarkable improvement of the tensile strength of GF/PP composites. In this study, the interfacial shear strength of GF/PP injection moldings was investigated by using the Kelly-Tyson formula. The effect of varying weight average molecular weight (Mw) of PP and Mw of PP-g-MAh on interfacial shear strength was elucidated.