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Study of the Effective Parameters on Mechanical Properties of PP/PET Microfibrillar Composite

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In situ microfibrillar PP/PET composite was produced using melt spinning process and a single screw extruder. A fiber grade PP in combination with two grades of PET, a virgin fiber and a recycled bottle grade, were used as the matrix and dispersed phases respectively. Taguchi method of experimental design was used to evaluate the effects of formulation and processing parameters on morphology and mechanical properties of microfibrillar composites (MFC).As the compatibilizer, the Glycidyl Methacrylate grafted Polypropylene, PP-g-GMA, was produced in an internal mixer. Three adaptors with different convergence angle were designed and fabricated to examine the effect of elongational flow on morphology and mechanical properties .The material and processing parameters which were studied include: the concentration and type of PET, compatibilizer level, tension speed, order of mixing and adaptor angle. SEM micrographs verified the formation of fibrillar morphology clearly. The results showed an increase in tensile strength, up to 55 percent in comparison with pure PP fibers, by increasing the concentration of PET and compatibilizer and tension speed. Also better results were obtained using recycled PET and a two step mixing process, premixing of PET with compatibilizer. As it was expected implicating more extension on the system by using higher adaptor angle led to the better results. Similar trends were found for modulus of elasticity in which a sharp increase, up to 350 percent, was seen then. The compression molded parts which were produced using the chopped MFC fibers showed mechanical properties comparable to glass fiber reinforced PP composites.