207a Effect of Particle Size on the Mechanical Properties of Pc/Pbt Blend Composites

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Ternary blends based on polycarbonate (PC), poly[butylene terephthalate] (PBT), and fine particles (» 1-2 um in diameter) are typically compounded at particle loadings ranging from 6–12% by weight in order to achieve a flexural modulus on the order of 3 GPa. This is advantageous for the production of exterior vehicle body panels, but the high loading levels that are required to obtain such a high modulus also significantly increase the weight or density of the part. Therefore, in an effort to maintain the flexural modulus of particle filled PC/PBT composites while reducing the particle loading level, and, hence, the density, fine particles were substituted with their nano-sized counterparts at particle loadings of 1%, 2%, 3%, and 6% by weight with a PC/PBT blend ratio of 60/40. At all particle loadings the flexural modulus of the composites generated with the nano-particles was much greater than that of the composites reinforced with micron-size particles, which can be attributed to the higher aspect ratio of the nano-particles. At a 1% loading of nano-particles, the flexural modulus was 20% greater than that of the unfilled matrix and equivalent to the composite generated with 6% by weight of micron-sized particles. This leads to a 3% reduction in density. Further modulus enhancement with increasing nano-particle loading was minimal (< 3% at a nano-particle loading of 6%) and can be attributed to agglomeration of the nano-particles at the higher loading levels as observed by TEM. It is interesting to note that the nano-particles were preferentially located in the PBT phase, which should help to improve the thermal properties (linear coefficient of thermal expansion) of the filled PC/PBT composites.