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The effect of particle size on the electrical and thermal properties of recycled copper filled polyester composites

Abstract

Due to high product value and some related environmental issues, recycled copper was used as filler in polyester system. The waste copper was collected from the milling machine. The effects of particle size distribution of recycled copper on properties of the polyester composites were studied based on the thermal stability, coefficient of thermal expansion (CTE), electrical conductivity and hardness. It was found that addition of recycled copper has improved the thermal stability of polyester. Incorporation of recycled copper has also decreased the CTE of the composites. From the aspect of different particle size distribution, monomodal distribution shows the most stabilised thermal behaviour with the highest degradation temperature of 314.41°C. However, insignificant effects of particle size distribution on the CTE values were found. In terms of electrical properties, recycled copper filled composites with average particle size of 16 µm exhibited the highest conductivity owing to better continuity provided by coarse particles. Meanwhile, composite with monomodal distribution has shown the highest hardness value due to more rapid collision of the particles and it distributes the stresses more effectively.

Keywords — Electrical properties, polyester, recycled copper, thermal properties, vickers hardness