

Mechanical and thermal properties of composites from unsaturated polyester filled with oil palm ash

ABSTRACT

Oil palm ash (OPA) is available in abundance, is renewable, can be obtained at no cost and shows good performance at high thermal conditions. Combinations of the unsaturated polyester with natural fillers have been reported to improve the mechanical and thermal properties of composites. Utilisation of oil palm ash as a filler in the manufacture of polymer composites can significantly reduce the requirement for other binders or matrixes of composite materials. This research uses oil palm ash as a filler to form composites through the investigation of the effect of different contents of filler on the properties of OPA-filled unsaturated polyester (UP/OPA) composites. The effect of different volume fractions, i.e., 0, 10, 20 and 30 vol.% of oil palm ash introduced into 100, 90, 80 and 70 vol.% of an unsaturated polyester matrix on the composite mechanical properties, i.e., tensile and flexural, has been studied, together with thermal gravimetric analysis (TGA) and differential scanning calorimetric (DSC). Specimens were prepared using compression moulding techniques based on the ASTM D790 and D5083 standards for flexural and tensile tests, respectively. The tensile and flexural mechanical properties of UP/OPA composites were improved in modulus by increasing the filler content. Thermal stability of the composites increased as the OPA filler content was increased, which was a logical consequence because of the high thermal stability of the silica compound of the OPA filler compared with that of the UP matrix. The results from the surface electron microscope (SEM) analysis were the extension of mechanical and thermal tests.

Keyword: Oil palm ash; Unsaturated polyester; Filled composites; Mechanical properties; Thermal properties