Heat Transfer Modeling of Polymer Composites filled with Silver Coated Glass Spheres

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The effective thermal conductivity of silver coated spherical glass (SCSG) powders dispersed in ethylene vinyl acetate (EVA) matrix was investigated as a function of filler concentration. A periodical method was used to measure simultaneously thermal conductivity, specific heat and diffusivity of the EVA/SCSG composites at room temperature. A numerical study by finite element method using software *COMSOL 3.5a* was carried out to modeling the thermal heat transport and to calculate the effective thermal conductivity of the composite for three elementary cells; simple cubic (SC), body center cubic (BCC) and face center cubic (FCC). The effect of contact resistance between inclusion/matrix (*C*) and the ratio of thermal conductivities of filler/matrix (*D*) are also taken into account in the numerical study. The obtained values were discussed and compared to experimental ones and to some theoretical models. The results indicate that the calculated values of thermal conductivity increase with the increasing of the filler content and are also in agreement with the measurements ones. Besides, the analytical models show a good agreement with the numerical data for FCC and BCC models. However, for the SC model case, we notice a divergence between the numerical data and the analytical models for a higher filler concentration. The contact resistance between the filler and the polymeric matrix induce an important effect on the thermal conductivity of the composite when 10-2<c<10-1.