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Polymerization kinetics of boron carbide/epoxy composites

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Abstract-

This study employs Differential Scanning Calorimetry (DSC) technique and focuses on the curing kinetics and the activation energy of the commercial epoxy resin (which cures at room temperature for 12 h) filled with boron carbide particles (B4C) in different amount (6 and 12 wt%) and particle size (60 nm, 7 and 23 ?m). An isothermal dwell at different temperatures (25, 35 and 50 °C) was used for 180 min. Thereafter, the temperature is increased by 5 °C min?1 up to 200 °C to complete the curing process. Conversion degree is calculated by combining both methods. The kinetic constant and the reaction order are calculated using Kamal's equation with diffusion control. Consequently, the activation energy is computed assuming Arrhenius’ equation.The results show a significant influence of the temperature on the reaction mechanism. Furthermore, polymerization kinetics is affected by B4C additions depending on the amount and size of the added particles.

Index Terms- Epoxy resin; Curing process kinetics; Boron carbide; Diffusion control

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