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Thermal behavior of gamma-irradiated urea–formaldehyde composites based on the differently activated montmorillonite K10

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Abstract

This work investigated the thermal characteristics of irradiated composite materials formulated on the urea–formaldehyde resin (UF) and differently activated montmorillonite (K10). UF resin with molar ratio $F{:}U = 0.8$ was synthesized in situ with differently activated K10. K10 was activated by heating at 400 °C, with sulfuric acid (H_2SO_4) without and with magnetic stirring. The samples are marked with TK10, AK10, ASK10, UF/TK10, UF/AK10, and UF/ASK10, respectively. The samples were identified by applying X-ray diffraction analysis and thermal methods (TGA and DTA), supported by data from Fourier Transform Infrared spectroscopy and scanning electron microscopy. The degree of activation was determined by measuring specific surface area (SSA) using Sear's method. Measurement of the value for SSA shows that the sample TK10 has the highest value (317 $m^2\ g^{-1}$) among the other two samples, (for AK10 = 183 $m^2\ g^{-1}$ and ASK10 = 167 $m^2\ g^{-1}$). The modified UF/AK10 composite is more thermally stable than other two modified UF/K10 composites.

Keywords γ-Irradiation · Montmorillonite · UF resin · Thermal stability

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