

# A Novel Comparative Study: Synthesis, Characterization, and Thermal Degradation Kinetics of a Copolymer and Its Composites with Activated Charcoal

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**Abstract:** A novel composite was prepared by using a copolymer involving 2-amino 6-nitrobenzothiazole– formaldehyde copolymer and activated charcoal. Physicochemical analysis, elemental and spectrum analysis were used to characterize the produced copolymer and its composite. SEM and thermogravimetric analysis (TGA) was used to study the surface morphology and thermal stability of the copolymer and its composites, respectively. The composite produced better results, which could be attributed to the particle size, porous nature, and increased surface area. The thermal stability of the copolymer and its composite had been improved. The thermodynamic kinetic parameters activation energy, free energy, apparent entropy, frequency factor, and entropy change were also estimated from TG data using the Sharp-Wentworth and Freeman-Carroll methods, and the findings were found to be similar. First-order kinetics were used to decompose the copolymer and its composite. The copolymer and its composite decomposed using first-order kinetics.

**Keywords:** Composites; Charcoal; Activation Energy; Thermogravimetric; Free Energy.

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