Kinetic Study of Thermal Degradation of a Lignin Nanoparticle-Reinforced Phenolic Foam

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Abstract : In the present study, the kinetics of thermal degradation of a phenolic and lignin reinforced phenolic foams, and the lignin used as reinforcement were studied and the activation energies of their degradation processes were obtained by a DAEM model. The average values for five heating rates of the mean activation energies obtained were: 99.1, 128.2, and 144.0 kJ.mol-1 for the phenolic foam, 109.5, 113.3, and 153.0 kJ.mol-1 for the lignin reinforcement, and 82.1, 106.9, and 124.4 kJ. mol-1 for the lignin reinforced phenolic foam. The standard deviation ranges calculated for each sample were 1.27-8.85, 2.22-12.82, and 3.17-8.11 kJ.mol-1 for the phenolic foam, lignin and the reinforced foam, respectively. The DAEM model showed low mean square errors (< 1x10-5), proving that is a suitable model to study the kinetics of thermal degradation of the foams and the reinforcement.

Keywords : kinetics, lignin, phenolic foam, thermal degradation

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