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Kinetic Parameter Estimation from Thermogravimetry and Microscale Combustion Calorimetry

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Abstract : Flammability analysis of extruded polystyrene (XPS) has become crucial due to its utilization as insulation material for energy efficient buildings. Using the Kissinger-Akahira-Sunose and Flynn-Wall-Ozawa methods, the degradation kinetics of two pure XPS from the local market, red and grey ones, were obtained from the results of thermogravity analysis (TG) and microscale combustion calorimetry (MCC) experiments performed under the same heating rates. From the experiments, it was discovered that red XPS released more heat than grey XPS and both materials showed two mass loss stages. Consequently, the kinetic parameters for red XPS were higher than grey XPS. A comparative evaluation of activation energies from MCC and TG showed an insignificant degree of deviation signifying an equivalent apparent activation energy from both methods. However, different activation energy profiles as a result of the different chemical pathways were presented when the dependencies of the activation energies on extent of conversion for TG and MCC were compared.

Keywords : flammability, microscale combustion calorimetry, thermogravity analysis, thermal degradation, kinetic analysis
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