

Thermal Degradation Kinetics of Field-Dried and Pelletized Switchgrass

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Abstract : Thermal degradation kinetics of switchgrass (*Panicum virgatum*) from the field, as well as in a pellet form, are presented. Thermogravimetric analysis tests were performed at heating rates of 10-40 K min⁻¹ in an inert atmosphere. The activation energy and the pre-exponential factor were calculated using the Ozawa/Flynn/Wall method as suggested by the ASTM Standard Test Method for Decomposition Kinetics by Thermogravimetry. Four stages were seen in the degradation: dehydration, active pyrolysis of hemicellulose, active pyrolysis of cellulose, and passive pyrolysis. The derivative mass loss peak for active pyrolysis of cellulose in the field-dried sample was much higher than the pelletized. The range of activation energy in the 0.15 - 0.70 conversion interval was 191 - 242 kJ mol⁻¹ for the field-dried and 130-192 kJ mol⁻¹ for the pellets. The highest activation energies were achieved at 0.50 conversion and were 242 kJ mol⁻¹ and 192 kJ mol⁻¹ for the field-dried and pellets, respectively. The thermal degradation and activation energies were comparable to switchgrass and other biomass reported in the literature.

Keywords : biomass, switchgrass, thermal degradation, thermogravimetric analysis

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