Thermal oxidative degradation kinetics of agricultural residues using distributed activation energy model and global kinetic model

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Thermal oxidative degradation kinetics of agricultural residues using distributed activation energy model and global kinetic model

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Notes

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Abstract

The study concerned the thermal oxidative degradation kinetics of agricultural residues, peanut shell (PS) and sunflower shell (SS). The thermal behaviors were evaluated via thermogravimetric analysis and the kinetic parameters were determined by using distributed activation energy model (DAEM) and global kinetic model (GKM). Results showed that thermal oxidative decomposition of two samples processed in three zones; the ignition, burnout, and comprehensive combustibility between two agricultural residues were of great difference; and the combustion performance could be improved by boosting heating rate. The activation energy ranges calculated by the DAEM for the thermal oxidative degradation of PS and SS were 88.94–145.30 kJ mol^{-1} and 94.86–169.18 kJ mol^{-1}, respectively. The activation energy obtained by the GKM for the oxidative decomposition of hemicellulose and cellulose was obviously lower than that for the lignin oxidation at identical heating rate. To some degree, the determined kinetic parameters could acceptably simulate experimental data.

Keyword: Agricultural residues; Thermal oxidative degradation; Kinetic analysis; Distributed activation energy model (DAEM); Global kinetic model (GKM)