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Thermal decomposition and kinetics of coal and fermented cornstalk using thermogravimetric analysis

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1 **Thermal decomposition and kinetics of coal and fermented cornstalk**
2 **using thermogravimetric analysis**

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11 **Abstract:** The thermal behavior and kinetics of Yiluo coal (YC) and the residues of fermented
12 cornstalk (FC) were investigated in this study. The Kissinger-Akahira-Sunose (KAS) and
13 Flynn-Wall-Ozawa (FWO) methods were used for the kinetic analysis of the pyrolysis process.
14 The results showed that the activation energy (E_a) was increased with the increase of the thermal
15 conversion rate (α), and the average values of E_a of YC, FC and the blend ($m_{YC}/m_{FC}=6/4$) were
16 304.26, 224.94 and 233.46 kJ/mol, respectively. The order reaction model function for the blend
17 was also developed by the master-plots method. By comparing the E_a and the enthalpy, it was
18 found that the blend was favored to format activated complex due to the lower potential energy
19 barrier. Meanwhile, the average value of Gibbs free energy of the blend was 169.83 kJ/mol, and
20 the changes of entropies indicated that the pyrolysis process was evolved from ordered-state to
21 disordered-state.

22 **Keywords:** Coal; Fermented Cornstalk; Co-pyrolysis; Kinetic model; Thermodynamics

23 **1. Introduction**

24 Fossil fuels increased every year as a world energy consumption rapidly, the conflict of

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