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Combustion behaviors and kinetics analysis of coal, biomass and plastic

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Highlights:

- Chemical-structural properties of coal, biomass char were investigated by using Raman.
- The combustion characteristics of coal, biomass char and plastic were studied.
- The correlation between structure characteristics and its combustion were obtained.
- A TRNGM model was used to calculate the combustion process of plastic.

Abstract: In this paper, thermal analysis method (TGA) was adopted to describe the combustion behavior of bituminous coal(GC), anthracite(LC), biomass(PS) and plastic(PVC).The structure characteristics of these samples were carried out using Raman spectroscope followed by peak deconvolution and data analysis. The kinetic parameters and combustion reaction mechanism were obtained by fitting experimental data with the random nucleation nuclei growth model (RNGM) and volume model (VM) in order to find out the kinetics characteristics responsible for the combustion of the samples. The results indicate that significant difference between combustion process of these samples are mainly attributed to their differences structures, the combustion reactivity of PS is better than GC duo to the catalysis of alkali matter in biomass ash. RNGM model is better than VM model for simulating the combustion process, and TRNGM model plays a good performance in depicting the combustion process of PVC with three reaction stages.

Keyword: Combustibility; Thermogravimetric analysis; Kinetic models; Carbonaceous structure.

1 Introduction

Unreasonable consumption of fossil fuels has made a significant contribution to financial growth and industry

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