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Influences of sodium species with different occurrence modes on the thermal behaviors and gas evolution during pyrolysis of a sodium-rich Zhundong subbituminous coal

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ABSTRACT

The Zhundong coal (ZDC) with a huge proven reserve is featured by high abundance of sodium species which behaves actively in the thermal conversion of it. In this work, to better understand the multiple roles of sodium species in coal pyrolysis, influences of sodium species with different occurrence modes on the thermal behaviors and gas evolution during pyrolysis of a sodium-rich ZDC were investigated. Raw coal was initially demineralized by dilute hydrochloric acid. Subsequently, sodium species was reloaded into the demineralized sample by ion-exchanged or immersed method. For quantitative analyses, a thermo-gravimetric analyzer coupled with a mass spectrometer was used to record the weight loss of different samples and the ever-changing amount of gaseous products in pyrolysis. The results show that the structural change induced by demineralized and ion-exchanged treatment is mainly reflected in the band intensity of carboxyl groups. In pyrolysis of ZDC, total volatile matters yield has a close relation with the occurrence modes of sodium species. It is