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Effect of Minerals in Middlings on the Reactivity of Gasification-Coke by Blending a Large Proportion of Long Flame Coal

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Abstract : In this study, gasification-coke were produced by blending the middlings (MC), and coking coal (CC) and a large proportion of long flame coal (Shenfu coal, SC), the effects of blending ratio were investigated. Mineral evolution and crystalline order obtained by XRD methods were reproduced within reasonable accuracy. Structure characteristics of partially gasification-coke such as surface area and porosity were determined using the N_2 adsorption and mercury porosimetry. Experimental data of gasification-coke was dominated by the TGA results provided trend, reactivity differences between gasification-cokes are discussed in terms of structure characteristic, crystallinity, and alkali index (AI). The first-order reaction equation was suitable for the gasification reaction kinetics of CO_2 atmosphere which was represented by the volumetric reaction model with linear correlation coefficient above 0.985. The differences in the microporous structure of gasification-coke and catalysis caused by the minerals in parent coals were supposed to be the main factors which affect its reactivity. The addition of MC made the samples enriched with a large amount of ash causing a higher surface area and a lower crystalline order to gasification-coke which was beneficial to gasification reaction. The higher SiO_2 and Al_2O_3 contents, causing a decreasing AI value and increasing activation energy, which reduced the gasification reaction activity. It was found that the increasing amount of MC got a better performance on the coke gasification reactivity by blending > 30% SC with this coking process.

Keywords : low-rank coal, middlings, structure characteristic, mineral evolution, alkali index, gasification-coke, gasification kinetics
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