Modeling Char Surface Area Evolution during Coal Pyrolysis: Evolving Characteristics with Coal Rank

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Abstract

Crosslinked metaplast influences char N_2 adsorption specific surface area (S_{N2}), and the influence changes with coal rank significantly. When crosslinked metaplast is adequate, planar polycyclic aromatic structures overlap tightly and S_{N2} is small. When crosslinked metaplast content is small, S_{N2} in crosslinked metaplast is larger than that in the coal matrix and takes a considerable proportion of total char surface area. Two exponents, $k_{\text{mat order}}$ and $k_{\text{crlmet order}}$, representing order degrees of planar polycyclic aromatic structure arrangement in coal matrix and crosslinked metaplast, respectively, were introduced in the previous model for calculating the change of char surface area during coal pyrolysis. The previous model was extended to include predicting S_{N2} of subbituminous and high-volatile bituminous coals, and was validated with 5 subbituminous coals, and 2 bituminous coals. The change of S_{N2} with coal ranks and the transition characteristics between coal ranks can be predicted.

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