Study on the Effect of Pre-Oxidation on the Spontaneous Combustion Characteristics of Coal

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Abstract

Pre-oxidation will have a significant effect on the spontaneous combustion characteristics of coal, but so far there are still great differences in the views on the effect of pre-oxidation on the spontaneous combustion characteristics of coal. In theory, pre-oxidation consumes active substances to inhibit secondary oxidation, but in practical applications, it is often found that the spontaneous combustion characteristics of coal will be significantly enhanced after pre-oxidation. In order to explore the influence of pre-oxidation on coal spontaneous combustion characteristics, the spontaneous combustion characteristics and normal temperature oxidation characteristics of coal before and after pre-oxidation were studied through low-temperature oxidation experiment and pyrolytic-normal temperature oxidation experiment under air temperature. Then, the low temperature oxidation experiment under nitrogen atmosphere is compared with the low temperature oxidation experiment of air cooling to analyze the influence of cooling atmosphere on the secondary oxidation of coal. Finally, the changes of active functional groups and free radicals in coal were analyzed by means of FTIR and ESR. The research shows that the cooling under different gas atmospheres has a great influence on the spontaneous combustion characteristics of coal. Compared with raw coal, the pre-oxidation under air atmospheres has a inhibitory effect, while the pre-oxidation under nitrogen atmospheres has a catalytic effect in the early stage and a inhibitory effect in the later stage. It was found that the pre-oxidation process in the air atmosphere can lead to the reduction of alkyl side chains and active free radicals.

Keywords

Pre-Oxidation, Coal Spontaneous Combustion, Ambient Oxidation, Secondary Oxidation, Active Site