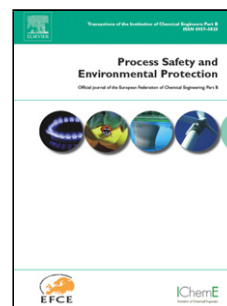


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An experimental study for characterization the process of coal oxidation and spontaneous combustion by electromagnetic radiation technique

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Abstract: Coal spontaneous combustion results from a complex reaction between coal and oxygen. Previous studies on coal oxidation spontaneous combustion process provided guidance for fire prevention and control. In this work, we present a novel electromagnetic radiation (EMR) method to detect spontaneous combustion of coal. We established a multi-index experimental system for estimating various factors during coal oxidation (heating) and combustion and analyzed the characteristic temperature, index gases, and EMR signals. With the increase of temperature, the central temperature of coal varies significantly with the temperature around the coal oxidation heating device. Besides, we simultaneously tested the EMR signals generated during coal oxidation and combustion. EMR signals showed a positive correlation with temperature changes (i.e., EMR signal intensity increases with the increase in temperature and vice versa). The change trend of EMR signals with the CO is notable, and there is a good correspondence between the EMR signals and the change rule of CO gas. With the increase of temperature, the dielectric properties of coal change quickly, resulting in the occurrence of thermal deformation and rupture

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