

Mineralogical Characteristics of Coal-based Cryptocrystalline Graphite in Lutang Area, Hunan Province, China

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Abstract: This paper studies the coal-based cryptocrystalline graphite in Lutang area, Hunan Province, China by using multidisciplinary techniques to explore the changing rules of the mineralogical characteristics of coal-based graphite with the variation of metamorphism degree. Through the method of system sampling, we selected coal-based graphite samples from Lutang with different degrees of metamorphism as our research objects. The chemical composition, mineral composition, crystal structure and thermal properties of graphite were studied by X-ray fluorescence spectroscopy (XRF), X-ray diffraction (XRD), scanning electron microscopy (SEM), laser Raman spectroscopy, thermogravimetry and other technical means. Results show that the graphite is mainly composed of cryptocrystalline graphite and a small amount of quartz, calcite, muscovite, chlorite and kaolinite, and the fixed carbon content is 41.95% ~ 88.43%. Graphite is mainly small and irregular scales, and its crystal form gradually improves with increasing degree of metamorphism. The degree of graphitization is high, and the value is 88.37% ~ 98.84%. The content of 3R multi-variant is 9.45% ~ 14.56%. The initial oxidation temperature of graphite is lower, at about 530 °C. The initial temperature and the termination temperature of the cryptocrystalline graphite are lower than that of the crystalline graphite. There are positive correlations for the degree of graphitization with the degree of crystallization, the initial temperature of oxidation and the degree of metamorphism of graphite, and there is a negative correlation between the content of 3R multi-variant and the degree of metamorphism.

Keywords: Lutang, Hunan province; coal-based graphite; chemical composition; crystal structure; thermal analysis