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DISTRIBUTION OF THE MINERAL PART COMPONENTS IN COAL OF VARIOUS DEGREES OF CRUSHING USING X-RAY FLUORESCENCE ANALYSIS

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This study investigates the distribution of major inorganic elements and trace elements among the fine and coarse particle size fractions of coking coal (<0.5 mm and 13–25 mm) formed during the screening and primary preparation stages. The relevance of this study stems from the limited availability of systematic data on the segregation of elements between fine and coarse fractions, which complicates the prediction of coking process parameters. Element concentrations were experimentally determined using XRF, followed by analysis of the differences in their content between particle size classes. The distribution of elements between particle size classes is determined by their geochemical nature, their form in coal (mineral or organic), as well as the microstructural characteristics and grindability of specific samples. It has been established that elements of a mineral nature (Si, Al, Fe, Ca, K, Ti) are in most cases enriched in the fine fraction, which indicates selective grinding and concentration of mineral matter in the finely dispersed fraction. The most pronounced fractionation is characteristic of Fe and Si, which is associated with the behavior of sulfide and aluminosilicate phases. At the same time, opposite trends have been observed in some samples, due to the morphology of mineral inclusions and the nature of "coal–rock" intergrowth. For elements with a predominant affinity for organic matter (Ni, Cr, Zr, Sr), the difference in concentrations is insignificant and does not demonstrate a consistent pattern, indicating their mixed or uniform distribution in the carbon matrix. It has been shown that the distribution of ash content and elemental composition is determined by the structural and textural characteristics of coal and does not follow universal relationships. The results obtained expand our understanding of the interphase distribution of elements and can be used to optimize the technological aspects of coal processing.

Keywords: coal, coking, mineral component, ash content, petrography, segregation

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