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The study of the structural characteristics of carbon Materials by mean of XRD analysis

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Abstract

The powder X-ray diffraction method is one of the important methods for describing the structural characteristics of carbon materials, the main advantage of which is that this method is non-destructive. It is used to perform qualitative and quantitative X-ray phase analysis (identification and quantification of phases), as well as to determine the structural characteristics of various samples in solid form, including materials based on carbon. This article summarizes the results of studies of the structural characteristics of carbon materials. Powder X-ray diffraction is used as the main method for describing the structural characteristics of crystalline ordered samples. As it turned out, carbon materials obtained on the basis of a coal tar pitch using the method of low-temperature graphitization contain simultaneously several phases of crystalline ordered carbon and amorphous carbon with a turbostructural structure. In order to explain the heterogeneous structure of carbon materials, the authors of the work compare the data of X-ray structural analysis on the main reflection reflections from the (00l) plane, i.e. the most developed surface of the crystal. It was found that the (002) and (004) reflections are superpositions of components that correspond to structural phases with different interplanar distances characteristic of crystalline and amorphous carbon. From the ratio of the integrated intensities of the separated components of the reflection, the ratio between these phases is determined. The interplanar distances that characterize crystalline carbon materials were also determined, based on which the degree of order was calculated, which also makes it possible to detect the difference between the components. The degree of order, the interlayer distance (d002) and the crystalline parameters (La and Lc) are considered key parameters for the evaluation of the structure of carbon materials

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