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The effect of carbon additives on crystal structure of coal tar pitch

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Abstract

The work is devoted to the study of changes in the basic structural characteristics of coal tar pitch during carbonization with various carbon additives that have different textural characteristics. An industrial medium-temperature coal tar pitch with a softening temperature of 87 °C was taken as a starting material, nanosized carbon material "Kemerit", nanotubes, activated carbon, and thermally expanded graphite are considered as carbon additives. It was found in the work that the entire range of considered carbon additives significantly increases the yield of coke residue, while it was noted that a decrease in the amount of released volatile products during the destruction of pitch during its thermal transformation was observed, which is very important for carcinogenic compounds. Of the selected series of carbon additives, the maximum amount of solid residue is formed when nanostructured carbon additives (nanotubes and nanosized carbon material "Kemerit") are introduced into coal tar pitch. The structural characteristics of coal tar pitch before and after the carbonization process, as well as all carbon additives considered in the work, were investigated by the complex of X-ray diffraction methods (X-ray phase and X-ray structural methods of analysis). It was revealed that the formed carbon material, when nanotubes and Kemerite are added to coal tar pitch, is characterized by a more disordered structure when compared with the structure of individual coal tar pitch. The addition of thermally expanded graphite into coal tar pitch promotes the formation of graphite-like structures during pitch carbonization and reduces the amount of volatile carcinogenic compounds during thermal destruction to a greater extent when compared with amorphous carbon additives.

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