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CAUSES OF DEVIATIONS OF REAL VALUES OF THE DYNAMIC VISCOSITY OF LOW-PYROLYZED COAL TAR FROM THE PREDICTED VALUES

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It is known that coal tar is a viscous multicomponent dispersed system, the dispersed phase of which includes particles insoluble in toluene and quinoline (small particles of coke, coal, etc.), as well as water droplets. Dynamic viscosity is an integral characteristic, because its value carries information about the resulting value of several important indicators. This is especially true for low pyrolysis tars, which is currently the most liquid on the domestic and world markets. The statistic shows that the complexity of the component composition of the tar, as well as its properties as a complex dispersed system, is the cause of significant deviations between the predicted and actual viscosity values. The rheological characteristics of the tars under study were determined on a Brookfield DV2T rotational viscometer with a thermal cell at varying temperature and shear rate. The temperature dependence of viscosity was estimated by the equations widely used in the literature, in particular Cornellisen-Waterman and DIPPR 101. Comparison of the temperature dependences of viscosity of two samples of low pyrolysis resins (R1 and R2) showed that the rheological behavior of resin R1 is in good agreement with the flow character predicted by the Cornellisen-Waterman and DIPPR 101 equations, and the behavior of resin R2 can be considered uncharacteristic for coal tar. In our opinion, the relatively high content of phenols causes a significant polarization of the components of R2 resin, and intermolecular interactions are established between polar substances, which complicate the flow of the tar. This is consistent with the existing ideas about the higher viscosity of polar aromatic substances compared to non-polar ones, and the flatter viscosity-temperature dependences are inherent in hydrocarbons with low dipole moment. Studies of the effect of the content of dispersed particles in the tar have shown that with increasing water content in the emulsion "water-in-resin" the viscosity of the system increases more noticeably, the lower the temperature. The obtained data indicate the need to make adjustments to the calculated viscosity values of coal tar of low pyrolysis taking into account the factors considered above.

Key words: coal tar, viscosity, temperature, rotational viscometer, degree of pyrolysis, polarity of the tar, quinoline insoluble substances.

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