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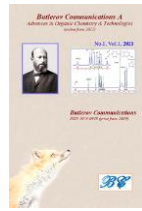

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Regularities of the relationship between the physico-chemical and optical properties for high-viscosity oil fractions

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Abstract

The relationship between a series of physical and chemical properties (molecular weight, boiling point, kinematic viscosity) and refractive-densiometric measurements (refractive index, molecular refraction) was studied for fractions of crude high-viscosity oils (HVO) and heat-treated oils from the Ashalchinsky and Astrakhan fields. An exponential empirical relationship is established between the kinematic viscosity and the molecular refraction of fractions with a boiling point range from 220 to 400 °C. The correlation coefficient is 0.99-1.00 for heat-treated and 0.98 for the fractions of the initial high-viscosity oils, respectively. The average absolute deviation for crude HVO fractions is 2.35 cSt, for heat-treated ones there is 12.39 cSt. For the relative deviation is 4.88% and 14.64%, respectively. The dependences of the boiling point of the fractions on the refractive index nD20 and molecular refraction have a linear form. It is shown that the dependence of the boiling point on the molar refraction is universal because it exists for all samples, including crude and heat-treated fractions of high-sulfur Ashalchinskaya and low-sulfur Astrakhan HVO. For the dependence of the molar mass on the refractive index, the absolute deviation is 42-44 g/mol. Therefore, the mass estimate is approximate. The established relationships allow us to predict the boiling point of fractions more accurately, provided that the average molar mass is clearly determined, for example, according to chromatography-mass spectrometry. It is shown that using refracto-densio-

metry, it is possible to estimate the viscosity and boiling point of high-viscosity oil fractions in laboratory and industrial conditions.

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