

Relationship between aromatic and naphthenic hydrocarbons amount for fractions of high-viscosity petroleum and integral optical spectral characteristics

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Abstract

The oil refining technology is existed the trend using high-viscosity oil by Russia and foreign country. The study of structural and chemical characteristics of oil and theirs group components is presented important for petrochemical and oil refining technology. The knowledge of these characteristics allows to choose the optimal parameters of technological processes.

The hydrocarbon fraction of high-viscosity Ashalchinskaya oil and products of their thermolysis were studed by the IR and electronic absorption spectroscopy. The boiling point range of fractions are choosed from 220 to 400 °C for these oils. The purpose of research is ascertainment of the relationship between mount of aromatic and naphthenic structures and a light integral absorption.

For this purpose was used the electron phenomenological spectroscopy (EPS). EPS was proposed in our previous works. Unlike conventional method, the EPS studies a substances as a single whole without separating the spectrum of the substance into characteristic frequencies and wavelengths of individual functional groups or components of the systems. The amount of aromatic and naphthenic structures were defined by known methods in infrared spectra. The amount of aromatic and naphthenic structures are estimated according to empirical dependences which links these characteristics with integral force of oscillator linking these structural characteristics with integral parameter (integral force of oscillator) of optical spectrum in UV and/or visible regions. The adequacy of the results is proved according to statistical processing data. The determination coefficients for naphthenic and aromatic structural parameters are 0.96 and 0.98. There is average absolute error from 1.07 to 1.98%. The average relative error exist in the range from 5.05% to 10.8%. These values testify in range of experimental error, that confirms the adequacy of experiment.

On based of establishment dependencies can be development analytic methodics for amount estimation of aromatic and naphthenic fractions in complex hydrocarbon systems, such as oil and products of oil processing, gas-condensate, products of high temperature pyrolysis of organic substances and etc.

The determined dependencies can be used in petrochemical, oil refining technology, oil reservoir engineering, also for quality estimation of oil and hydrocarbon fractions.

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