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Conversion of heavy oil in carbonic natural environment using catalyst - Iron disulfide

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Abstract

The purpose of the study was to assess the impact of hydrothermal and catalytic processes on the direction and depth of changes in the super-molecular components of heavy oil in the carbon environment, with the natural ferrous mineral - iron disulfide as a catalyst. The number of laboratory experiments showed the peculiarities of changes in the group and structural-group composition of heavy oil Ashalchinskoye field (Republic of Tatarstan) and its rheological characteristics of hydrothermal-catalytic processes. The experiments was taken at temperature of 250, 300 and 350 °C in a carbon dioxide environment using pyrite with chemical composition FeS2 as a natural mineral catalyst. It is shown that with increasing temperature up to 350 °C almost twice increased content of newly formed hydrocarbon fractions. It is owing to decrease the content of tar and asphaltenes, causing a decrease in the viscosity of heavy oil in 2-2.5 times in the temperature range 10-60 °C. The main difference heavy oil conversion in the presence of catalyst is activation of the flow of degradation reactions at C-C, C-N, C-O, C-S bounds, and in blocking polymerization reactions leading to the formation of coke-like products. Experiments demonstrated the direction of changes in the composition of heavy oil and its qualitative characteristics in hydrothermal-catalytic processes at temperatures of 250, 300 and 350 °C, using the natural mineral pyrite as a catalyst. In the presence of a catalyst compared to the original oil and the test-case products, the increase in temperature has been accompanied by a more intensive formation of saturated hydrocarbons, with a noticeable decrease in aromatic compounds and asphaltenes. The most profound transformations in the group composition of oil occur at a temperature of 350 °C. This is reflected in a reduction in the viscosity of heavy oil, as well as in changes in its structural and group characteristics, including asphaltenes. The work shows potential for using hydrothermalcatalytic processes for the upgrading of heavy oil composition.

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Keywords

Composition, Heavy oil, Hydrothermal catalytic transformations, Iron disulfide, Rheological properties

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