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Influence of rock-forming and catalytic additives on transformation of highly viscous heavy oil

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Abstract

© 2016 Pleiades Publishing, Ltd. The influence of the rock-forming additives kaolin and alumina in the presence of nickel compounds on the thermal catalytic conversion of heavy oil at a temperature of 360°C in a reducing atmosphere at different pressures in the system has been revealed. The effect of poly- α -olefins as a hydrogen donor has been examined. It has been found that there are predominant degradation reactions of the resinous components, aliphatic substituents in asphaltenes, and branched aliphatic structures accompanied by redistribution of n-alkanes toward homologues with a lower molecular weight, resulting in reduction in the viscosity of heavy oil. Conducting the process in the presence of Al₂O₃, Ni, and poly- α -olefins at a pressure of 8 MPa increases the quantity of light fractions of the oil and facilitates the degradation of asphaltenes. A decrease of pressure in the experiment on the oil with kaolin in a reducing atmosphere leads to a decrease in aromaticity of the final product and an increase in the yield of lube oil hydrocarbon and low-boiling fractions.

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Keywords

aquathermolysis, bulk composition, carbonate additive, heavy oil, kaolin, molecular weight distribution of n-alkanes