

Intensification of thermal steam methods of production of heavy oil using a catalyst based on cobalt

Sitnov S., Petrovnina M., Feoktistov D., Isakov D., Nurgaliev D., Amerkhanov M.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

The article aims to study the possibility of improving the efficiency of thermal steam methods of production of high-viscosity oil based on the results of laboratory modeling of catalytic and non-catalytic aquathermolysis. Study was conducted on the sample of high-viscosity oil of Ashalchinskoye field in conditions close to reservoir under thermal steam treatment: an initial pressure of 3 bar, temperature 150 and 180°C for 6 hours while adding the precursor (jointly and individually) of the catalyst and proton donor in the amount of 1% by weight of oil. Study presents the results of determining the viscosity-temperature characteristics and group composition by the SARA method of original and transformed oils. It is found that the oil samples after non-catalytic thermal steam exposure, both at 150°C and 180°C, are characterized by higher values of viscosity in comparison with other research subjects. It is connected, apparently, with the formation of high molecular weight alkanes as a result of the recombination of the destroyed fragments of high molecular weight components. In addition, the result of thermal steam exposure is a more dense structure due to the lack of protons available to bond with the formed radicals to prevent the process of increasing the molecular weight of the oil system. It is shown that the use of the catalyst, the active form of which is formed in situ, in combination with a protons donor allows to reduce the content of asphalt-resinous compounds. This provides an irreversible decrease in viscosity of produced oil, facilitates further transportation and processing.

Keywords

Aquathermolysis, Catalyst precursor, Heavy crude oil, In situ conversion, Transition metal