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Modelling of the thermal treatment process for oil deposit in the carbonate formation

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Abstract

© 2018, Neftyanoe Khozyaistvo. All rights reserved. The experience of oilfield development shows that at present when oilfields with heavy oils are developed the thermal methods, in particular thermal steam stimulation, have no alternative and have a priority among other methods. The thermal methods are most relevant for development of complex carbonate reservoirs, in which more than 60% of the world's oil reserves are concentrated. However, the recovery factor of the deposit is mostly very low. This is due to the textures complexity of carbonate reservoirs, the high heterogeneity of their composition and physical-chemical properties. Problems of carbonate reservoirs' development are dramatized by high oil density and viscosity of oil. Model experiments with variation of temperature, pressure and composition of the injected heat carrier will allow creating scientific bases of thermal technologies for development of carbonate reservoirs. The paper presents the results of a laboratory study of thermal stimulation of carbonate rock of the oil reservoir. The investigation was carried out on a specially designed flow-type setup equipped by original core holder. The core samples were selected from the Middle Carboniferous deposits of the Republic of Tatarstan. The influence of the composition of steam-gas eluent, temperature, and pressure on the permeability of carbonate rock, the composition both of gaseous thermolysis products and recoverable oil, and the efficiency of oil recovery from the carbonate rock were discussed. A relatively low-temperature (400 °C) decomposition of carbonates initiated by water vapor was established. It was shown that the thermal steam treatment at temperatures up to 500 °C was not accompanied by the destruction of oil components at a pressure of 4,0 MPa in the condensation zone. The most economical and ecological version of the thermal steam stimulation method for the carbonate oil reservoir was proposed.

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Keywords

Carbonate reservoir, Kerogen, Laboratory bench, Oil composition, Oil displacement, Pressure, Reservoir properties, Temperature, Thermal stimulation, Thermolysis products

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