

## Hydrocarbon generation in high-carbon formations under hydrothermal conditions

A.G. KALMYKOV<sup>1</sup>, A.YU. BYCHKOV<sup>1</sup>, I.A. BUGAEV<sup>1</sup>, G.A. KALMYKOV<sup>1</sup>, E.V. KOZLOVA<sup>1</sup>, M.T. TARNOPOLSKAYA<sup>1</sup>, YU.A. POPOVA<sup>1</sup>, N.S. BALUSHKINA<sup>1</sup>

<sup>1</sup>Moscow State University, Moscow, Russia,  
a.g.kalmykov@gmail.com

Nowadays most oil reserves in Russia and all over the world are hard to recover. That is the reason many scientists are trying to investigate new technologies for hydrocarbon generation and recovering from high-carbon formation reservoirs.

The principal technology of hydrocarbon (HC) generation under hydrothermal conditions was carried out. It was shown that in closed systems under water vapor pressure liquid HC could be formed in the temperature range between 250°C and 350°C with the maximum yield of liquid products at 300°C. The rock minerals play the main role in the process by catalyzing HC formation, while pure oil or kerogen do not change under such conditions. It was measured that 60% to 80% of kerogen that has generation potential was converted into liquid and gaseous HC. It was verified that after the process is finished S1 pyrolysis parameter that determine the amount of bithums is the same as before the experiment begins while S2 parameter is lowered.

Chromatography analysis has shown that liquid HC composition is closed to oil composition, although containing greater amount of highly-molecular compounds. In comparison chromatography analysis of liquid HC produced under 350°C contains many unidentified compounds which specifies coking process has started.

Kinetic experiments were carried out to find the optimal time that is necessary for the most amount of liquid HC to be produced. It was shown that catagenetic stage of kerogen should be taken into account for the time experiments. MK2-MK3 kerogen was maximally converted during 6-7 days, while unperformed kerogen PK3 produces the highest amount of liquid HC in about 24 hours. After the maximal amount is produced the process of HC cracking starts and liquid fraction converts to gas.

Investigated conditions are not far enough from reservoir conditions making the proposed process very perspective for hard to recover reservoirs exploration.

*The study was performed by epy grant from the Russian Science Foundation (Project No 15-17-00010).*