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Synthetic petroleum stability under thermobaric conditions of the Earth crust

Aleksandr Serovaiskii (1,2), Anton Kolesnikov (3), Vladimir Kutcherov (4,5)

(1) Gubkin Russian State University of oil and gas, Moscow, Russian Federation (alexandrserov@gmail.com), (2) KTH Royal Institute of Technology, Stockholm, Sweden (aleser@kth.se), (3) Gubkin Russian State University of oil and gas, Moscow, Russian Federation (tonyenot@gmail.com), (4) KTH Royal Institute of Technology, Stockholm, Sweden (vladimir.kutcherov@indek.kth.se), (5) Gubkin Russian State University of oil and gas, Moscow, Russian Federation

Nowadays there are several dozens of large crude oil deposits at the depth more than 10 km (Kutcherov and Krayushkin, 2010). The existence of such deep oil fields at the depth exceeding conventional “oil window” could be explained by the migration of the deep fluid from the asthenosphere. This fluid migrates up to the surface and forms oil and gas deposits in different kind of rocks in the on various depths of the Earth’s crust.
Crude oil consists of a great numbers of different hydrocarbons. Its precise molecular composition is impossible to investigate nowadays. Instead of the natural hydrocarbons mixture synthetic petroleum with simpler composition was used in the experiments.
The synthetic petroleum stability was investigated at the Earth crust thermobaric conditions corresponding to the depth down to 50 km. The experiments were carried out in Diamond Anvil Cells (DAC) with the internal resistive heating. Raman spectroscopy was used to analyse the petroleum composition. The analysis of the sample was made in situ during the experiment. Ruby and Sm:YAG Raman shifts were the controllers of the temperature and pressure inside the sample (Trots et al., 2012; Mao et al., 1986).
Three series of the experiments were carried out at 320°C and 0.7GPa, 420°C and 1.2GPa, 450°C and 1.4GPa. After the experiment the Raman spectra of the sample was compared to the reference spectra of the petroleum before the experiment. The comparison showed no changes in the sample’s composition after the experiment.
Obtained data may explain the existence of deep oil fields located deeper than the “oil window”. It can broaden the knowledge about the existing range of depths for the crude oil and natural gas deposits in the Earth crust. The evidence of the petroleum existence in the Earth low crust may support the existence of unconventional, deep abyssal hydrocarbons source.