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# Formation of hydrocarbons under upper mantle conditions: experimental view

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Main postulates of the theory of abiogenic abyssal origin of petroleum have been developed in the last 50 years in Russia and Ukraine. According to this theory, hydrocarbon compounds were generated in the mantle and migrated through the deep faults into the Earth's crust. There they formed oil and gas deposits in any kinds of rocks and in any kind of their structural positions. Until recently the main obstacle to accept the theory was the lack of reliable and reproducible experimental data confirming the possibility of the synthesis of complex hydrocarbon systems under the mantle conditions. The results received in the last decade by different groups of researchers from Russia, U.S.A. and China have confirmed the possibility of generation of hydrocarbons from inorganic materials, highly distributed in the Earth's mantle, under thermobaric conditions of 70-250 km: 2 – 5 GPa and 1000-1500 K. Experiments made in the CONAC chamber at pressures of 3-5 GPa and temperatures of 1000-1500 K by Kutcherov et al. [1, 2] have demonstrated that the mixtures of hydrocarbons with composition similar to natural hydrocarbon systems have been received as a result of chemical reactions between $CaCO_3$, FeO and $H_2O$. Methane formation from the same compounds was registered after heating up to 600-1500 K at pressures of 4-11 GPa in diamond anvil cells [4, 5, 6]. Influence of oxidation state of carbon donor and cooling rate of the fluid synthesized at high pressure were studied using different types of high pressure equipments. It was shown that composition of the final hydrocarbon mixture depends on these parameters. Experimental investigations of transformation of methane and ethane at 2-5 GPa and 1000-1500 K [3] confirmed thermodynamic stability of heavy hydrocarbons in the upper mantle and showed the possibility of hydrocarbon chain growth even at oxidative environment.

For development of the theory of abiogenic abyssal origin of petroleum it is necessary to arrange a set of new experiments to understand the pathways of hydrocarbons formation, influence of pressure, temperature, oxygen fugacity and chemical composition of the environment on the content of the mantle fluid.

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