Geochemical investigations of West Siberian source rocks: deposition conditions, unconventional reservoirs formation, oil pool research

A.G. KALMYKOV[1], G.A. KALMYKOV[1], A.Y. BYCHKOV[1]

[1]Lomonosov Moscow State University, Moscow, Russia, a.g.kalmykov@gmail.com

According the U.S. Energy Information administration unconventional oil plays in Russia storage the most amount of shale oil in the world (75 billion barrels), and West Siberian source rocks are the main oil deposit. Technology of horizontal well drilling and multistage hydrofracturing allows to obtain oil commercial inflows in some regions, but other fields show low amount of free oil and are unpromising for oil production. Therefor new criteria of high-yield oil fields research are necessary. Combination of organic and inorganic geochemistry methods can fix information gap on deposition conditions of source rocks, describe secondary process and provide geological properties of unconventional reservoirs formation, that would increase effectiveness of oil pool research.

Rock-eval investigations, GC-MS analysis, and hydrous pyrolysis were used for organic matter characterization. Inorganic rocks were investigated by SEM, carbonate isotopy and ISP-MS method. Four types of unconventional reservoirs were determined. Lithological investigations combined with ICP-MS determined the difference in deposition conditions that lead to carbonate, radiolarian and phosphorite reservoirs formation. Complex of investigations has shown that secondary processes effect pore space formation in these reservoirs, indicating high influence of hydrothermal change of rocks, silica dissolution and new generation mineral deposition. High temperatures indicated by isotope analysis transform source rocks and organic matter resulting kerogen porosity formation. GC-MS analysis provide biomarker criteria for unconventional reservoirs. Combination of obtained results with geological data on region structure features allow to develop technology for oil pool research.

Hydrous pyrolysis performed on rock samples in laboratory was used to model processes of oil generation pore space formation in source rocks. It has shown influence of rock properties on pore space change, confirm some of figured criteria and provide perspective method for future technologies of oil formation in source rocks *in situ*.

That is technology based on geochemical analysis might be a useful tool for oil search in unconventional plays.

This work was partially supported by RFBR grant 18-35-20036.