Features of Lower Triassic reservoir rocks of Vilyuy syncline (Eastern Siberia)

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Lower Triassic reservoir rocks of the Vilyuy syncline are represented by terrigenous and unconventional volcanogenic-sedimentary deposits (Dmitrievsky, 1982). They were accumulated in alluvial and deltaic (subaerial) environments. Postsedimentary transformations of metastable rock-forming components of sandy and silty intermediate-mafic tuffs and tuffites, have significant influence on the formation of reservoir properties of these rocks (Karnyushina & Zhukova, 2013).

The author studied the relationship between open porosity of the Lower Triassic reservoirs and their mineral composition on core samples from well 19 of Srednevilyuyskoe gas-condensate field, from well 4 of Severo-Lindenskaya and from well 280 of Horogochumskaya areas. Investigation of the reservoir rocks was carried out in petrographic thin sections under polarizing microscope. Open porosity of samples was determined by gas porosimeter "Ekspresspor 2000" (Ivanov *et al.*, 2008).

Terrigenous gas-bearing horizons are distinguished in Taganzhinskaya Formation deposits of the Srednevilyuyskoe field. The Taganzhinskaya Formation is represented by alternating fine- and medium-grained quartz-greywacke carbonated sandstones with subordinate interlayers of siltstone, mudstone and grussy-gravelly rocks in the upper part of the formation. There are impurities of volcanic material. Thickness of the Tagandzhinskaya Formation is about 400 m. The Monomskaya Formation lies over the Taganzhinskaya Formation and composes of carbonated and zeolitized sandy tuff, crystal-vitric fine- and medium-grained tuffite, shaled out silty tuffite, subordinate role belongs to tuffaceous siltstone and sandstone (Dmitrievsky *et al.*, 2002).

Secondary mineralization causes reduction of primary pore space, formation of secondary reservoirs and often becomes a reason of reservoir to non-reservoir inversion (Dmitrievsky *et al.*, 2002; Karnyushina, 1988; Karnyushina & Zhukova, 2013). This can be demonstrated by several examples. Partial reduction of the pore space due to zeolitization is observed in tuffs (Fig. 1).

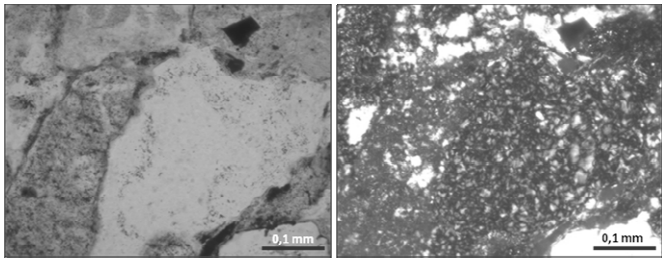

Fig. 1.: Zeolitized tuffs. Sample 69: photo micrograph of the petrografic thin section (from left to right: parallel and crossed nicols). Well Srednevilyuyskaya-19, depth 2435 m, open porosity factor 20 %.

Authigenic carbonatization leads to corrosion, partial replacement of clastic grains and complete filling pores by calcite (Fig. 2). Argillization of the tuff can provoke secondary fractured reservoir appearance (Fig. 3) or secondary seal formation.

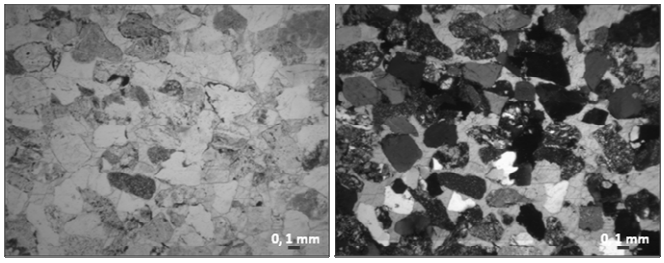

Fig. 2.: Fine-grained sandstones with secondary carbonate pore-filling cement. Sample 70: photo micrograph of the petrografic thin section (from left to right: parallel and crossed nicols). Well Srednevilyuyskaya-19, depth 2440 m, open porosity factor 11 %.

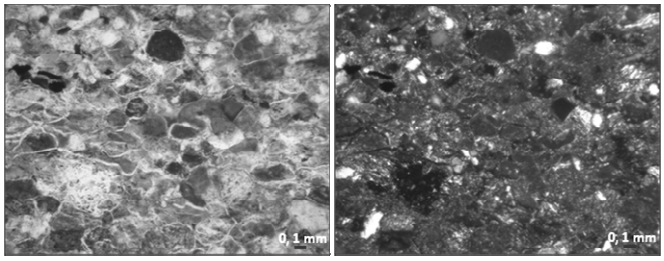

Fig. 3.: Shaled out and fractured tuffs. Sample 38: photo micrograph of the petrografic thin section (from left to right: parallel and crossed nicols). Well Severo-Lindenskaya-4, depth 1990 m.

Identified features of terrigenous and volcanic-terrigenous reservoir rock transformations indicate that the assessment of their secondary alteration is required as part of oil and gas forecast for Lower Triassic rocks of the Vilyuy syncline.

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