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Discovery of the Jurassic oil under the coverage of volcanic rocks, Tuquan Basin, NE China

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Songliao and Xia Liaohe Basins are the domestic district for oil and gas exploration with the main target strata of the Cretaceous and the Paleogene system respectively, NE China. Compared with the research about the Cretaceous, the Jurassic periphery Songliao Basin is usually ignored by traditional view result in the large area of volcanic rock coverage and little study. The occurrence of the Jurassic system is recognized as low and small isolated depression which only related to coal resources.

The analysis on the tectonics and paleo environment about the Jurassic of NE Asia suggests that the low small isolated depression may be “the window” of the considerable fault Basin under volcanic coverage. 5 new Basins have been outlined in blank area periphery Songliao Basin by “the window” assumption, and Tuquan Basin was selected as the first one to be operated.

Field mapping, outcrop profile, and geo-physical survey (Gravity-magnetic-magnetotelluric-seismic investigation and Joint Inversion) indicate that the area of Tuquan Basin is about 2385km², CHEN Shuwang et al. [1], with the coverage of 800m to 2000m volcanic burial, FANG Hui et al. [2]. The total thickness of the Jurassic source rock is about 113.0m with the thickest monolayer is 13.5m. Statistic data of geochemical analysis from outcrop and coal drill show as: TOC 0.56-6.24% (average 2.04%), Hydrocarbon generation potential 0.16-42.96 mg/g (average of 5.38mg/g), Chloroform-extracted bitumen 0.001-0.83% (average of 0.146%). Vitrinite reflectance values ranged from 0.94 to 1.50% with the average of 1.19%. A parametric well (TC1) aimed to reveal the target stratum and possible oil was carried out after detailed 2D seismic exploration. When it reached the early Jurassic strata at 1684-1704m, the oil immersed to oil spot was discovered. Some light crude oil (density of 0.812g/cm³, viscosity of 3.61mm²/s) was obtained after hydraulic fracturing, CHEN Shuwang et al. [3].

The discovery of the Jurassic oil in Tuquan Basin explains the assumption as an innovation against tradition view: the strata related to the early to middle Jurassic does not occurred as low and small isolated depression, but in the fault Basins. It is the coverage of volcanic rocks that cause the oil potential has been ignored. Follow this opinion, some indications of oil and gas related to the Jurassic strata are also discovered in Jinyang Basin, Xiushui Basin and Niuyingzi Basin, NE China.

References:

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