

Diagenetic impact on reservoir quality in deeply buried tight Rotliegend Sandstones – case study of Polish Permian Basin

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During burial, sediments and rocks undergo physical and chemical changes due to temperature and pressure growth. All these processes are known as diagenesis (Boggs 2009). These changes play an important role in postdepositional modification of reservoir parameters, such as porosity, permeability and filtration. Primary porosity of rock may be reduced by cement precipitation, mechanical compaction, mineral reactions or pressure solutions, and moreover increased (secondary porosity) during burial, as a result of grain and cement dissolutions, mineral reactions or fracturing (Bjørlykke 1983). Permeability is controlled mainly by pore – throat size (Pittman 1992) and its loss corresponds to the decreasing volume of primary porosity (Pittman 1992, Dutton & Loucks 2010). The aim of presented work was investigation of diagenetic changes within deeply buried tight Rotliegend Sandstones from Polish part of Southern Permian Basin and their impact on reservoir properties of rocks.

For the research were selected 26 core samples from 16 wells and depth interval 3439.8–4284.7 m. All wells are located within the aeolian sediments of Eastern Erg (central part of Polish part of Permian Basin). Samples are represented by medium – and fine – grained quartz arenites and wackes. Qualitative examination of samples included petrographic analysis of thin sections in polarizing microscope in transmitted light and scanning electron microscopy. Numerical characterization

of pore space was obtained during petrophysical analysis on 11 samples, using mercury porosimetry.

Diagenetic processes strongly amended reservoir parameters of rocks. The greatest impact on the decrease of primary porosity had mechanical compaction. It resulted in the development of long grain contacts. As the main cement component were identified clays, with subordination of carbonate, ferruginous and anhydrite minerals. Porosity of analyzed samples does not exceeded 6%, permeability – 0.1 mD.

Reservoir properties of Rotliegend Sandstones were affected by diagenesis, forced by temperature and pressure growth during burial. Primary porosity of sandstones was decreased by mechanical compaction and cement precipitation. Observed evidence of secondary porosity was created due to dissolution of less stable minerals – feldspars. Precipitation of authigenic clay minerals also highly reduced permeability and filtration of sandstones.

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