

BASIN-CENTERED GAS ACCUMULATIONS IN ROTLIEGEND SANDSTONES – CASE STUDY OF POLISH PERMIAN BASIN, FIRST RESULTS

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Permian Basin covers one of the world's largest gas-bearing clastic formation – Permian Rotliegend Group. Reservoirs are supplied by Carboniferous sources, lying directly beneath. Permian Rotliegend sandstones belong to the most important gas bearing formations in Poland. They were deposited in playa, fluvial and aeolian depositional systems (Kiersnowski et al. 2010). Both conventional and unconventional accumulations occur in those sediments. Some of unconventional accumulations occur in conditions of Basin-Centered Gas System (BCGS). Basin-Centered Gas Systems are unconventional with the greatest economical potential in the world. They are gas saturated, abnormally pressured, a low-permeability reservoirs commonly showing lack of a down – dip water contact. Two types BCGS can be distinguished – direct and indirect. Differentiation results from the attributes of the system – type of organic matter, thermal maturity, sealing and the distance of hydrocarbons migration (Law 2002). Direct Basin-Centered Gas Systems may occur in the area of the Polish part of Permian Basin. The purpose of present studies was indicating Permian Rotliegend sandstones as a reservoir rocks for direct Basin-Centered Gas Accumulations, which are associated with BCGS, according to reflectance of vitrinite measurement and permeability.

Analysis were performed on eight core samples located within the aeolian sediments of Eastern Erg (center of Polish part of Permian Basin) from the depth interval 3702–4200 m. Vitrinite reflectance measurement (R_o) were performed on polished pellets, under oil immersion with Zeiss Axioplan microscope in reflected white light. Mean reflectance values were calculated for all measurement. Permeability measurements were done on plug-type samples (cylindrical with diameter 25.4 mm and length of between 20–40 mm. Plugs were drilled perpendicularly to the cylinder axis.

In each sample organic matter was dominated by vitrinite. It could indicate humic organic matter typical for gas prone source rocks. The measured vitrinite reflectance values confirmed that organic matter reached the maturation stages of hydrocarbon generation, characteristic for the gas window phase ($R_o > 2\%$). Permeability results shown typical values for tight sandstones from BCGS, lower than 0.1 mD.

Performed studies on aeolian Rotliegend sandstones from Eastern Erg area confirmed the opportunity of Basin-Centered Gas Accumulations occurrence in those sediments. Humic type of organic matter and values of vitrinite reflectance corresponding to gas window phase are specific for BSGAs. Analyzed samples of aeolian Rotliegend sandstones are characterized by very low permeability, not exceeding 0.1 mD and therefore capillary sealing of the accumulation. Carboniferous source rock located directly beneath reservoir rock, confirmed short distance of hydrocarbons migration. All mentioned factors allow classifying aeolian Rotliegend sandstones as a reservoir rock within Basin-Centered Gas System.

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