

# Basin-centered gas accumulations in Rotliegend Sandstones

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Permian Rotliegend Sandstones are the most important gas reservoirs in north-west Europe (Gast et al. 2010). Those sandstones were deposited in playa, fluvial and aeolian depositional systems (Kiersnowski et al. 2010) and may host both conventional and unconventional deposits. The reservoirs are supplied in hydrocarbons by the Carboniferous sediments, lying directly beneath. Some of the unconventional accumulations may occur in conditions of Basin-Centered Gas System (BCGS). Basin-Centred Gas Accumulations (BCGAs), associated with BCGS, are gas-saturated, abnormally pressured, have a low-permeability reservoir and commonly lack of down-dip water contact (Law 2002). Two types BCGAs can be distinguished – direct and indirect, and they differ in the attributes of the system – the type of organic matter, thermal maturity, sealing and the distance of hydrocarbons migration. Direct Basin-Centered Gas Systems may occur in the area of the Polish part of the Permian Basin. The purpose of the present work was to indicate the Aeolian Permian Rotliegend sandstones as a reservoir rocks for direct Basin-Centered Gas Accumulations, according to the petrophysical properties and reflectance of vitrinite measurements.

Analysis was performed on fifteen core samples located within the aeolian sediments of Eastern Erg (center of Polish part of Permian Basin) from the depth interval 3,559.3–4,275.9 m.

Random reflectance of vitrinite was measured under oil immersion using Carl Zeiss Axioplan microscope in reflected monochromatic non-polarised 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 perpendicular to the cylinder axis. Values of average capillary diameter were obtained from porosimetric analysis on bulk samples with AutoPore 9220 mercury porosimeter.

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

Analysis performed on aeolian Rotliegend sandstones from the area of Eastern Erg confirmed their potential as a reservoir rock for Basin-Centered Gas Accumulations. Humic type of organic matter and values vitrinite reflectance corresponding to gas window are specific for BCGAs. The analyzed samples of the aeolian Rotliegend sandstones are characterized by very low

permeability, not exceeding 0.1 mD and slow flow rates, what determines capillary sealing of the accumulation. Short distance of hydrocarbons migration was confirmed by the location of Carboniferous source rocks. All those factors allow to classify the aeolian Rotliegend sandstones as a potential reservoir rock for Basin-Centered Gas Accumulations.

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