THE INFLUENCE OF LITHOFACIAL VARIATION ON THE DESORBED AND RESIDUAL GAS AMOUNT IN THE CONTEXT OF PETROPHYSICAL STUDIES

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Introduction

The aim of the research was to determine the dependence of different types of geochemical parameters on the lithofacial variation of the studied rocks, mainly from polish copper mines deposits. Determination of this type of regularity and recognition of individual released gas products from various types of rocks (for example: sandstone, dolomite, anhydrite, rock salt) will allow prediction of gas accumulation sites, which affects to increased safety in mines *(Kania and Janiga, 2018)*. The molecular composition and the exact amount of released gases were analysed using chromatographic methods. The tests were carried out on desorbed gas samples, representing that part of the gas which occupy the open pore space and on residual gas samples, representing that part of the gas which is released from the core after crushing the sample in a closed gas-tight container *(Diamond and Schatzel, 1998; Janiga and Kania, 2014)*. Additionally, the petrophysical properties of the rocks from which the gas was obtained, were subjected to statistical analysis.

Results

Based on the obtained research results, rocks such as sandstones and dolomites are highly porous (in the range from 1.7% to 28.5% for sandstone and from 0.3% to 17.8% for dolomite samples), and permeable, which promotes the phenomenon of accumulation and gas migration in these zones (the highest mean values of the residual gas amount from the studied lithology). We observe that the average amount of separated residual gas strongly correlates with petrophysical properties, such as: mean values of total and open porosity, specific surface area and permeability (figure 1).

Available results of permeability tests for anhydrite samples suggest that in the analysed area, there are no conditions for deposit gas concentrations due to their poor collector properties of rocks (very low permeability values). However, there are conditions for the occurrence of local gas traps in zones with increased porosity (for individual sample up to 11.9%), containing significant hydrocarbons with admixture of hydrogen sulphide.

Generally, the salt deposit, characterized as little permeable to gases, has an average total porosity of 2.6% and a vertical permeability value of up to 3.4 mD. However, the irregular shape of the basement of the not permeable salt deposit may be conducive to the formation of gas traps, with high amounts of nitrogen with an admixture of hydrocarbons, causing a danger to mine workings.

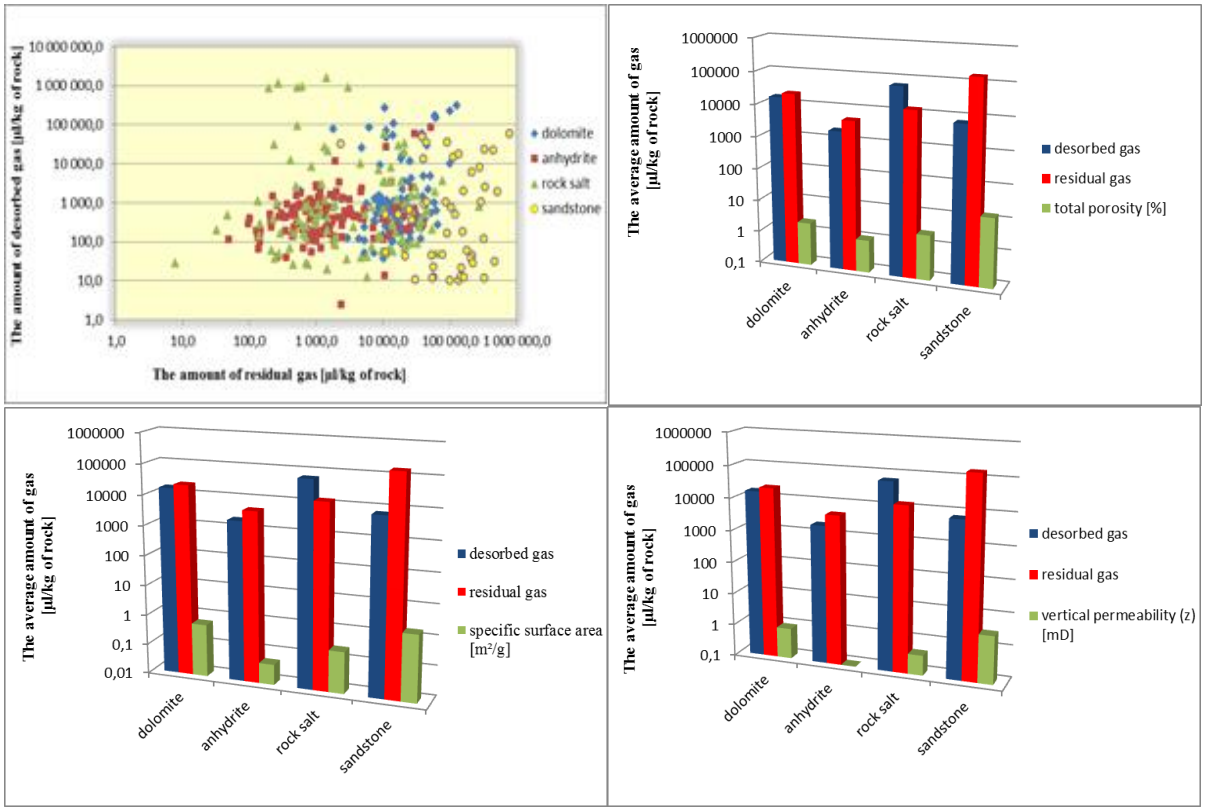

Figure 1 *Correlation between the amount of desorbed and residual gas and some petrophysical properties for various types of rocks.*

The high content of nitrogen in gas samples of desorbed rock salt may be explained by selective adsorption during long distance migration of gas (Kotarba et al., 2006) (through cracks and natural cleavages in Carboniferous basement and in the Rotliegend deposits and Zechstein Limestone). Although nitrogen may origins involving mixing from multiple sources (Poszytek et al., 2018).

Conclusions

The amount and molecular composition of desorbed gases and separated during the degassing of rock cores is strongly correlated with the lithofacial variation of the studied cores (Kania and Janiga, 2018). Additionally, we observe that the average amount of separated residual gas strongly correlates with some petrophysical properties and can be helpful with examination of the gas-bearing rocks occurrence in the future will contribute to maintain the mine safety.

References

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