GEO LAB LOG PLATFORM (GLLP) AS A TOOL FOR NMR AND MICP RESULTS JOINT INTERPRETATION

Edyta PUSKARCZYK[1], Paulina KRAKOWSKA[1], Artur KRZYŻAK[1], Krzysztof JANC[1]

[1]*AGH University of Science and Technology, Faculty of Geology Geophysics and Environmental Protection, al. A. Mickiewicza 30, 30-059 Krakow, Poland; puskar@agh.edu.pl*

Introduction

Joint analysis of nuclear magnetic resonance, NMR and mercury injection capillary pressure, MICP data facilitated the development of a universal way to evaluate the properties of porous structures of the examined rocks. The differentiation between NMR and MICP distributions reflects the heterogeneous character of the set of samples diversified in terms of lithology and age. Integration of NMR and MICP results was enabled getting the information on pore diameter and extrapolation of the relationship to lower pores.

In this paper we focused on carbonates. Data set comprised of samples of Main Dolomite deposits. All samples were taken from a S-1 well located on the inner platform oolitic shallowness of Grotów Peninsula.

Methods

On the basis of the data collected the correlation relation between the transverse relaxation time and the pore throat diameter was calculated. Analysis were done by using two different methods: graphical plots overlaying and automatic matching using home - built software GLLP.

Geo Lab Log Platform, GLLP is a homemade software designed for storage, processing and interpretation lab data obtained from different methods. The Geo Lab Log Platform, GLLP platform was used for analysis, allowing the collection of data from various research methods, their comparison and joint interpretation. GLLP allows to: import the data from different measurements to one or several datasets, export the data to lab files or log-friendly files, create compact dataset, make calculations and analyses, interpret the data, prepare the data to well logging. The application of the GLLP program allows to shorten the analysis time and makes it easier.

Results

In the first stage of data analysis basic statistics for the measured parameters were determined and correlation graphs for the results of different lab methods were created. Box plots were created for various parameters obtained from NMR and MICP. A similar range of measurements can be observed, however, the results of effective porosity obtained from NMR measurements give a wider spectrum of values.

The next step during testing GLLP platform was to create a correlation/plots between results of different measurement technique. In general, a linear relationship between NMR data and MICP data has been found for wider pores, whereas smaller pore radii could pose problems. An explanation for this is the inaccessibility of the finer structures of the pore system to mercury. The

mercury porosimetry method was used to calibrate the distributions of T2 transverse relaxation time as a function of pore size, because MICP method provides direct information on the distribution of pore throats in rock. The differentiation between NMR and MICP distributions reflects the heterogeneous character of the set of samples diversified in terms of lithology and age. Small pores and fractures correspond to short T2 transverse relaxation times and high capillary pressures.

Conclusions

GLLP is an effective tool for collecting, processing and interpreting measurement results from various research techniques. Using the software, the analysis of NMR and MICP results was performed on the example of selected carbonate rock samples. Joint analysis of NMR sand MICP facilitated the development of a universal way to evaluate the properties of porous structures of the examined rocks.

Acknowledgments

The authors are much indebted to the Polish Oil and Gas Company (PGNiG SA., Warsaw, Poland) for providing core samples. The studies were funded by NCBiR project No PBS2/A2/16/2013.