EXPRESS SEGREGATION OF HEAVILY CLAIYSH SAMPLES DURING THE PETROPHYSICAL STUDIES

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Reservoir rock properties acquired in laboratory conditions are needed for interpretation of well logging, reservoir parameters feasibility study and hydrodynamic reservoir modeling.

All existing types of core laboratory analysis start with the process of core samples preparation. Any deviations from the established procedure may affect veracity of resultant petrophysical parameters.

It is known, that for conducting standard and special studies, core samples undergo several stages of sample preparation, including cleaning and drying process. During cleaning, oil, bitumen, water and salts are eliminated from pore spaces (according to Russian Standards GOST 26450.0, 1985; GOST 26450.2, 1985). Then, after extraction, but before drying, it is necessary to split samples into 2 groups. The first group of samples with high clay content must be dried at a temperature of 70 °C. When all water is removed, samples have to be cooled in desiccators over highly dispersed silica gel (according to Russian Standards GOST 26450.0, 1985; GOST 26450.2, 1985). The second group, in which samples are not heavily clayish, can be dried at a temperature of 105 °C.

It is worthy to note that, if heavily clayish samples are not found, it will cause irretrievable consequences. The use of high temperatures (70 °C) during drying of heavily clayish samples can lead to the clay structure destruction.

If take into account not just Russian, but also American Standards, very similar requirement of core sample preparation for petrophysical studies can be seen. For instance, it is written in ASTM D 4925 (2013) and API RP 40 (1998), that sandstones with low clay content should be dried at a temperature of approximately 100°C, but heavy clayish core samples at a temperature of 63 °C. Samples containing clays must not be dehydrated during preparation. Care must be exercised in drying these samples.

However, Standards of both countries GOST 26450.0 (1985), GOST 26450.2 (1985), ASTM D 4925 (2013) and API RP 40 (1998) do not specify the procedure of how to select heavily clayish core samples from all core samples.

At present time, in petrophysical laboratories, separation of samples into two groups depending on their clay content is conducted quite subjectively, since geologists do not have an express and at the same time precise tool for the samples separation. This subjective approach does not exclude the situation of "unsuccessful separation". And it is particularly difficult to work with fine-grained sandstones and siltstones with high clay content.

Nowadays, the core samples clayiness is defined as pur results of granulometric analysis procedure or X-ray diffraction analysis of core samples. Both methods are quite labour-consuming and require special equipment. In [3, 4] the method of core clayiness determination by express analysis is presented. This method verifies the compliance with range incorporating heavily clayish rocks (the method of indicator solution).

The present study is aimed to evaluating whether or not it is possible to apply express-analysis of determination clayiness of core samples by means of the optical method. The samples were taken from reservoirs in Western Siberia on the basis of their compliance with the range attributable to heavily clayish rocks.

Photoelectric photometer CPC-3-01 was used to determine the indicator solution optical density observing optimal conditions for spectral registration. Mass scale shaliness value was determined based on the data from granulometric analysis.

The research has shown that the optical density of indicator solution falls down to zero for heavily clayish core samples.

As a result, the developed and tested indicator solution allows to subdivide core samples objectively into two separate groups in process of sample preparation for petrophysical researches based on their clayiness range.

References

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