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EVALUATION OF POSTSEDIMENTATIONAL PROCESS INFLUENCE ON FILTRATION-CAPACITOR PROPERTIES OF CHALKY DEPOSITS OF THE WESTERN SIBERIA NORTH

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The dependences between petrophysical parameters: porosity, volumetric density, permeability and lithochemical characteristics: content of uranium, alumina and value of the U/Al_2O_3 module, have been examined on the example of Creataceous age productive deposits opened by the Pestsovaya well 209 on territory of Yamalo-Nenetskiy autonomous region. Values of correlation coefficients between volumetric density and alumina content, and also open porosity and alumina content allow evaluating the intensity of secondary mineral formation in collector rocks.

Filtration-capacitor properties (FCP) of collector rocks are formed at the stage of their sedimentational and postsedimenational development. Until recently it was thought that the main contribution in FCP of terrigenous rocks was contributed by sedimentational processes. However, a lot of researchers lately pay more attention to postsedimenational processes [1].

Uranium takes an active part in processes of the imposed epigenesis, therefore the research of geochemical balance between uranium and alumina allows evaluating the intensity of postsedimentational processes at the stage of formation of the zone of hydrocarbon (HC) accumulation. The lower the value of the module U/Al_2O_3 the greater degree of desalination by carbondioxide is endured by rocks [2]. At opening of the zone of HC accumulation and reduction of the partial pressure of CO_2 in the system water-breed the pH of solutions sharply increases. It leads to fallout of secondary minerals from stratal waters.

The values of correlation coefficients (CC) between the volumetric density and the content of alumina, and also between the open porosity and the content of alumina were used for evaluation of the intensity of secondary mineral-formation in collector rocks. At absence of secondary mineral-formation in terrigenous rocks a positive correlation connection between the volumetric density and alumina and a negative between the open porosity and alumina should be observed. Inversion of these dependences is caused, as a rule, by secondary mineral-formation.

Such complex analysis of petrophysical and lithophysical parameters allows assessing a degree of influence of postsedimentational processes on FCP of terrigenous collector rocks.

As an example let's consider the results of researches of petrophysical and lithophysical characteristics of samples of rocks selected in the cut of Pestsovaya well 209.

The cut of Pestsovaya well 209, drilled in territory of Yamalo-Nenetskiy autonomous region, was investigated by core samples selected from intervals: 3109,6...3126,3 m; 3624,6...3757,7 m which characterize layers of Sortymaskaya formation.

Analytical works were executed using Tomsk research nuclear reactor by the method of latent neutrons, allowing to measure contents of uranium and alumina [3].

The interval 3109,6...3126,3 m (Sorotymskaya formation – layer $БУ_{10}$) is characterized by sandstones with rare prolayers of aleurosandstones.

Sandstones are light grey colors with a greenish shade. The structure of rocks is medium-grained up to coarse-grained, partially fine-grained. The cement of rocks is argillo-arbonaceous. Structures are homogeneous, less often undulately-layered and flat-layered. Lamination is formed due to intercalations enriched by aggregative flakes of micas. Rocks are porous. Odor of HC is marked along the cut of the interval.

The dependence of volumetric density (σ) and open porosity (K_P) of rocks from contents of alumina ($C_{Al_2O_3}$) for rocks of the layer $БУ_{10}$ of Pestsovaya well 209 is shown on figs. 1 and 2. It is visible that the density of rocks at reduction of alumina contents decreases, and the open porosity grows. The value CC in the first case is equal to 0,55, and in the second is equal to 0,55. Such character of dependence of the considered parameters testifies that depositions of the layer $БУ_{10}$ characterize a young zone of HC accumulation which the negative postsedimentational processes have poorly touched.

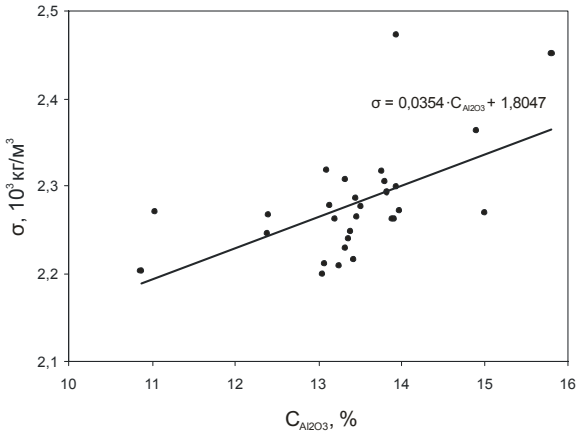

Fig. 1. *Dependence of volumetric density on content of alumina*

The dependence of permeability (K_{PR}) from the open porosity (fig. 3), and also the histogram of the module U/Al_2O_3 distribution for samples of the layer $БУ_{10}$ of Pestsovaya well 209 testifies to an insignificant role of processes of secondary condensation (fig. 4). It is well visible that high values of permeability are caused by development of processes of the imposed epigenesis in the sy-

stem water-rock, i. e. processes responsible for the initial stage of formation of the zone of HC accumulation. Such lithogeochemical parameters are characteristic for rocks of the layers possessing high capacitor properties.

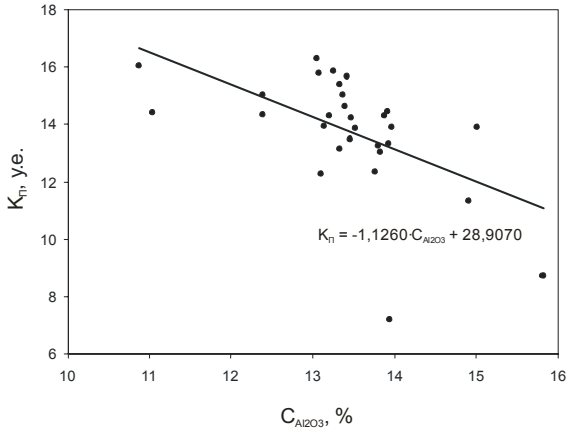

Fig. 2. *Dependence of open porosity on content of alumina*

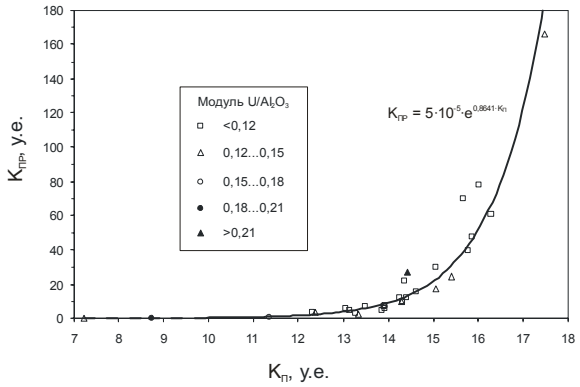

Fig. 3. *Dependence of permeability on open porosity*

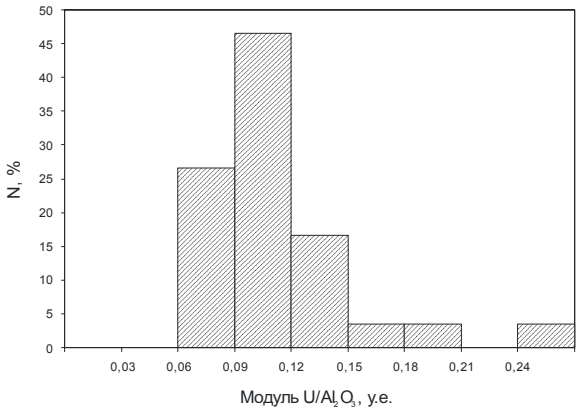

Fig. 4. *Distribution of the module U/Al_2O_3*

It is necessary to note that in Achimovskiy and Jurassic depositions the layers with such has not been opened during evolutionary development, i. e. rocks of blanketing possessed high shielding properties.

The interval 3624,6...3757,7 m (Sortymskaya formation – layers $А ч_5^0$, $А ч_5^1$, $А ч_6^0$) is characterized by depositions presented from top to bottom by alternation argillites, sandstones, aleuroargillites.

Sandstones are light grey color with a greenish shade, partially brownish shade (depth 3707,5...3708,5 m). Structures of rocks are fine-grained (layer $А ч_5^0$), transforming downwards along the cut into finely-medium-grained (layer $А ч_5^1$) and inequigranular (layer $А ч_6^0$). The cement of rocks is hydromica-carbonaceous and carbonaceous. By structure the rocks are homogeneous, sometimes obliquely- undulately-layered, falteringly obliquely-laminated, less often horizontally-layered. Lamination of rocks is caused by prolayers enriched by carbonified vegetative organic substance, mica and argillous material. Rocks of the investigated layers are dense, strong, poorly microporous. Weak odor of HC is noted along the studied interval of the rock.

The dependence of the volumetric density and the open porosity of brocks from contents alumina for rocks of layers $А ч_5^0$, $А ч_5^1$, $А ч_6^0$ of Pestsovaya well 209 is shown on fig. 5 and 6. The value of CC in the first case is equal to 0,0004 and the second to –0,022. As has been was already marked, it testifies to essential influence of secondary mineral-formation on FCP rocks.

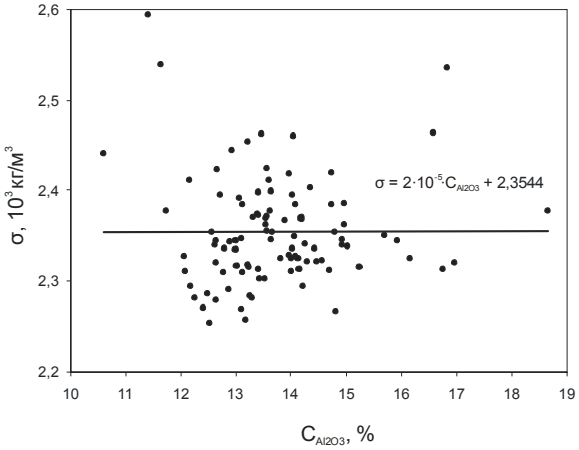

Fig. 5. *Dependence of density on content of alumina*

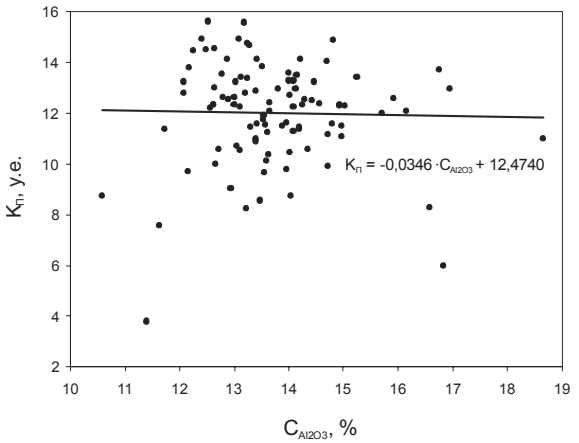

Fig. 6. *Dependence of open porosity on content of alumina*

The character of the dependence of permeability from the open porosity testifies to it (fig. 7), as well as the character of distribution of the module U/Al_2O_3 for rock samples of layers $А ч_5^0$, $А ч_5^1$, $А ч_6^0$ of Pestsovaya well 209 (fig. 8).

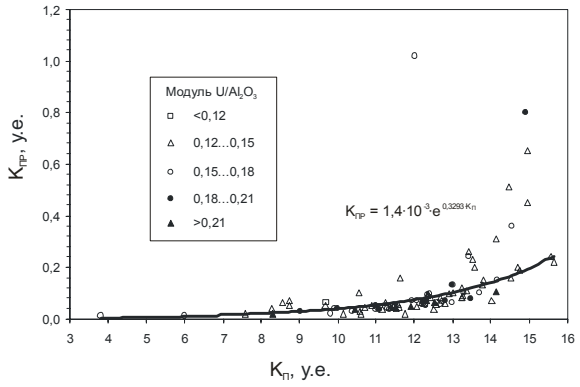

Fig. 7. *Dependence of permeability on open porosity*

The information cited here convincingly testifies that at the stage of formation of the zone of HC accumulation in Achimovskiy depositions the processes of the imposed epigenesist have rendered a strong positive influence on development of FCP of rocks. However, at a later stage of development of this zone the processes of secondary mineral-formation have led to essential deterioration of capacitor properties of rocks of Achinskiy depositions. It might have been caused by opening of the zone of HC accumulation in Achimovskiy depositions.

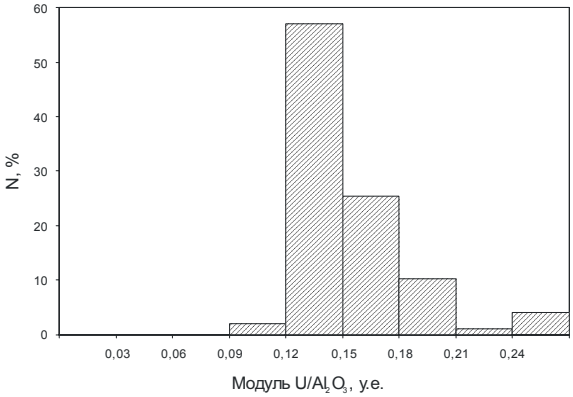

Fig. 8. *Distribution of the module U/Al_2O_3*

Thus, the carried out researches testify that high filtrational-capacitor properties of breeds in young, from the point of view of evolutionary age, zones of HC accumulation are caused by prevalence of processes of epigenic desalination above processes of secondary mineral-formation.

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