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Modern Processes of Hydrocarbon Migration and Re-Formation of Oil and Gas Fields (Based on the Results of Monitoring and Geochemical Studies)

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Special geochemical studies of oils allowed to allocate a movable migration component of oils in the industrial oil deposits. In the field the migration component of oils varies in different parts of the field. The largest percentage of the light migration component (gas condensate of the oil) was detected in the central part of the Kama-Kinel troughs system.
Monitoring of the composition of water, oil and gas (condensate light oil component) in the sedimentary cover and ni crystalline basement led to the conclusion of modern migration of hydrocarbons in sedimentary cover. This proves the existence of the modern processes of formation and reformation of oil and gas fields.
This presentation is dedicated to the problem of definition of geochemical criteria of selection of hydrocarbons deposit reformation zone in the sample wells of Minibaevskaya area of Romashkinskoye field. While carrying out this work we examined 11 samples of oil from the Upper Devonian Pashiysky horizon. Four oil samples were collected from wells reckoned among the "anomalous" zones that were marked out according to the results of geophysical, oil field and geological research.
Geochemical studies of oils were conducted in the laboratory of geochemistry of the Kazan (Volga-region) Federal University.
The wells where the signs of hydrocarbons influx from the deep zones of the crust were recorded are considered to be "anomalous". A number of scientists connect this fact to the hypothesis about periodic influx of deep hydrocarbons to the oil deposits of Romashkinskoye field. Other researchers believe that the source rocks of the adjacent valleys sedimentary cover generate gases when entering the main zone of gas formation, which then migrate up the section and passing through the previously formed deposits of oil, change and "lighten" their composition. Regardless of the point of view on the source of the hydrocarbons, the study of the process of deposits refilling with light hydrocarbons is an important fundamental task of exceptional practical importance.
The reservoir water monitoring has been conducted in five wells that have penetrated the water-saturated, loosely aggregated zones of the South Tatarstan Arch's basement. The long-term testing resulted in the production of reservoir water from the basement. The sedimentary cover in these wells is blocked by the column, which prevents water cross-flowing from the sedimentary cover.
The observations have shown that the levels, gas saturation, mineralisation, density, and composition of reservoir waters from the loosely aggregated zones of the basement change with time. The varying characteristics of the water include its component composition, redox potential, and amount of chlorine and some other components and trace elements.
Compositional changes in gases of the loosely aggregated zones of the basement, variations in the gas saturation of reservoir waters and of their composition, the decreasing density of oil in the sedimentary cover, – all result from one cause. This cause is the movement of fluids (solutions and gases dissolved in them) through the loosely aggregated zones and faults of the Earth's crust and the sedimentary cover. The fluids mainly move vertically in an upward direction, although their migration through subhorizontal, loosely aggregated zones of the crystalline basement is also possible.
Fluid migration still takes place in the Earth's crust of ancient platforms. This phenomenon indicates that some portions of the platforms – primarily, their margins – periodically resume tectonic activities. The fluid dynamic activity of the crust define the processes in the sedimentary cover. It affects the development of the sedimentary basin during the sedimentation period, and the formation of mineral deposits.
The monitoring of the present-day movement of fluid systems in the loosely aggregated zones of the basement will permit the more detailed study of the present-day fluid regime in the upper portion of the Earth's crust and the sedimentary cover.