Geochemistry of formation strong, very strong, and ultrastrong brines

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Research Methods

All saline waters and brines are conventionally divided into: saturated and close to equilibrium (SI> -5), undersaturated (from -5 >SI> -15), sharply undersaturated (SI< -15) according to the most characteristic values of the mineral saturation indices [1].

Discussion of Results

Brines of Cl-Ca, Cl-Ca-Na, and Cl-Na types from the Yurubcheno-Tokhomo hydrocarbon accumulation zone (YTHAZ) with TDS: 24-476 g/l and pH: 2,3-7,9 are detected in the Paleozoic, Proterozoic and Archean sediments.

An analysis of equilibrium state between groundwater of the YTHAZ and the evaporite formation minerals confirms that minerals are barriers on the path of accumulation of individual elements in solutions. Thus, these minerals control evolution and the direction of changes in groundwater chemical composition. In this case, secondary mineral formations are the products of this evolution.

Mineral classes	SI min	SI max	SI med	Number of samples
Carbonates	-15,0	8,8	-2,7	38
Sulfates	-8,5	3,7	-2,0	36
Halides	-9,6	-1,6	-3,8	40
Silicates	-87	-36	-41,4	14

Table 1: The saturation indices (SI) of selected minerals

There is a sharp difference in the cationic composition of the buried sea waters of various stages of concentration (sodium, magnesium-sodium and magnesium) from the modern composition of metamorphosed underground brines (calcium-sodium, sodium-calcium and calcium). It indicates a change in the saturation state of brines with respect to the considered minerals in time. Thus, the interaction of brines with silicates and aluminosilicates is one of the leading ways of metamorphization their chemical composition due to the exchange of matter with the solid phase.

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