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# Hydrogeochemistry of thermomineral waters within the Tien Shan region (Central Asia)

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The main purpose of the work was to identify the conditions of thermomineral waters formation within mountain ranges on the example of the Tien Shan mountain system.

The research area is characterized by a complex geological structure. Metamorphic, volcanogenic and sedimentary formations from ancient (Archean) to modern (Cenozoic) ages have been found here.

The thermomineral waters of the area are distributed in various hydrogeological structures. This area is complicated by a multitude of regional and local faults various orders. They are probably the sources of the intake of deep fluids.

The complex geological and tectonic structure of the research area contributes to the formation of mineral waters of various temperatures, TDS, chemical and gas composition.

The abstract presents new data on the chemical composition, content and distribution patterns of stable isotopes of oxygen ($\delta^{18}O$) and hydrogen ($\delta D$) in natural mineral waters of the northwestern part of Central Asia. The work was based on hydrogeochemical and isotopic data obtained during 2019-2023 fieldwork.

The outlet temperature of natural mineral waters varies within a wide range (from 16,2 to 52,3 °C). The thermomineral waters under consideration are slightly alkaline (pH 7,4-9,8) and characterized by a reducing environment (Eh -164,4 – -19,3 mV).

TDS of this thermomineral waters varies widely from 0,3 g/L ($SO_4$-Na; $HCO_3$-Na chemical type) to 34,0 g/L (Cl-Na chemical type). It depends on its attribution to the hydrogeological structure (sedimentary cover of the artesian intermountain basin or its mountainous frame). The anionic composition of mineral waters is almost always dominated by Cl-ion (from 32 to 94 %-eq); the cationic composition is always dominated by the sodium ion (from 54 to 95 %-eq). Studied mineral waters showed higher levels of fluoride ion (0,3 to 19,2 mg/L), bromide ion (0,1 to 11,6 mg/L), boron ion (0,2 to 19,4 mg/L), and silicon (2,0 to 23,7 mg/L). Bromine and boron content in water naturally increases as TDS increases. The highest fluoride concentrations were recorded in waters characterized by the lowest TDS. Isotopic data indicate the infiltration genesis of waters.

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