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Process of serpentinization in tensile zones of the ocean core

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One among the most perspective direction in studying the ocean floor is the research of hydrothermal fields within the most active zone — in the rift valleys, where the processes of spreading of the ocean floor, uplift of the deep matter to the surface of the ocean floor, and creation of the new oceanic crust occur. Volcanic activity here is accompanied with the formation of hydrothermal system executing separation, transfer, and precipitation of a series of chemical elements. Ore deposits with high concentration of iron, manganese, copper, nickel, cobalt, etc. are formed as a result of hydrothermal activity. It is much less known that hydrothermal activity has important, but not so evident result —formation of abiogenic methane and hydrocarbons.

The system of mid-oceanic ridges is characterized by development of basaltic volcanism and absence of sedimentary cover on the young oceanic crust. High seismicity and increased heat flow here promote development of hydrothermal activity and high degree of hydration of rocks of oceanic crust and upper mantle in the tensile zones. Proposed model of hydrocarbons formation on the oceanic floor is reduced to the fact that thermal and mineral springs observed on the Earth's surface are not juvenile. They are related with secondary degassing of the Earth. Water and gas emanated from hydrotherms have exogenous nature and are scooped from hydrosphere of the planet.

Iron is one among spread elements capable of reducing the carbonic-acid gas to methane and sulfate-ion to sulfide. Considering the process of hydration and serpentinization of ferriferous silicate of gabbroids and, especially, ultrabasic rocks, it shout be taken into account that oxidation of ferrous iron of primary silicates is mainly accompanied by formation of hematite. The main minerals of mantle ultrabasic rocks and gabbroids are olivine and enstatite. They form loop-shaped serpentinite in ultrabasic rocks when they enter into combination with water at a temperature of greenstone metamorphism (below 400o C). Hydration of gabbroids is accompanied by formation of hydrosilicates. For determination of characteristic features of generating of methane and hydrogen in hydrothermal systems of mid-oceanic ridges, reaction of hydration of ferriferous silicates of the oceanic crust will be presented in the generalized form by reactions of serpentinization of olivine and hypersthene (enstatite). All reactions of hydration of such type are exothermal and accompanied by release of heat (the heat effect in calorie per gram of initial matter at 400o C is presented in the end of each reaction).