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The effect of biote on accumulations of uranium, phosphorus, gold, silver, barium and other elements in sediments of the Akademicheskiy Ridge of Lake Baikal

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The effect of microorganisms on accumulations of uranium, phosphorus, gold, silver, barium, arsenic, iron, and manganese was studied in the initial stages of sediment rocks formation. For this purpose, sediments of Lake Baikal represented by diatomaceous ooze were studied within the boundaries of the Akademicheskiy Ridge. Complex investigation of element distributions in the parts of sediment cores from Lake Baikal (St8, St11) using methods of activation autoradiography and SEM was conducted. The sediment cores were obtained using a method permitting sampling of undisturbed original structures. The studied intervals are represented by gradual transition from glacial clays to diatomaceous oozes. Diatomaceous horizons are 50% composed of diatomaceous algae material. In the cores of St8 and St11, on the depths of 219-221 cm and 111 cm, brown phosphate layers and concretions enriched by iron hydroxides occurred between the diatomaceous oozes. These intervals were studied in detail using the autoradiographic methods and SEM. The distribution of U was studied by neutron induced fission autoradiography via ^{235}U(n,f). The distribution of P was studied by neutron activation autoradiography via ^{31}P(n,β)^{32}P.

Accumulation of uranium (up to 60-90 ppm), arsenic, strontium, fluorine, and iron occurred in those parts of the sediment cores St8 and St 11, where phosphate layers and concretions composed of phosphatized diatomaceous oozes were discovered. Concentrations of these elements in the phosphate up to 3-30 times exceed background concentrations, which are typical for clayey parts of the sediment. At the same time,

the ratios of a group of elements (K, Th, Ti) are the same either in phosphorite as diatomaceous ooze. According to activation analysis data, increased concentrations of gold are connected with the phosphorite formations. According to SEM analysis data, internal parts of diatoms, included in siliceous shell, were exposed to phosphatization processes. In addition, the SEM data showed that calcium-deficient hydroxyapatite is prevalent in the phosphatized diatoms. In rare cases, the phosphates with ratios of phosphorus and calcium close to apatite were found. In single cases, phosphates with the calcium-phosphorus ratio typical for hydroxyapatite were discovered.

The obtained data showed that authigenic phosphorites, which are formed under active participation of diatomaceous algae, occur in sediments of Lake Baikal. It is possible that the phosphorite deposits, which are concentrators of uranium and other elements, have a considerable areal distribution. In that case, concretions of uranium-bearing phosphorites can be good paleomarkers for sediment chronometry and paleoclimatic reconstructions in Lake Baikal.

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