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Biohemogenic transformations of clay minerals in modern sediments of lake baikal russian federation

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The composition, structure, and polymorphous modifications of clay minerals that form bottom sediments of the lake Baikal have been studied. It is established that the transformation of clay substance in early diagenesis is mainly due to the processes of illithization of smectite. However, in the zone of hydrocarbon seepage, registered at the bottom of the lake, the changes are more intense. The main reason is probably an increase in the number of microorganisms in the bottom layer (by 10-100 times) due to the cultivated microbial community that oxidizes oil and methane. The degradation of organic matter by methylotrophs depends on the enzymatic activity, for which various macro and trace elements are needed-P, N, Fe, Cu, Mo, etc. Expansion of the population reduces in water the content of chemical elements necessary for metabolism, so it becomes necessary to use a clay substrate, saturated with organomineral compositions. These compounds are partially or completely extracted from the bottom sediments by microorganisms capable of creating a potential difference. Thus, it can be assumed that in the zone of hydrocarbon seepage metastable mixed-layer minerals are transformed more intensively, and some part of the mica of the muscovite polytype 2M1 may have authigenic genesis. The process proceeds with a gradual ordering of the structure from illite-smectite to modification 1M, and then 2M1. Therefore, in sediments from the seepage zone, all three phases are recorded simultaneously (by results of spectral and structural methods of research). As the cations are extracted by the organisms, an unbalanced negative charge accrues to the unit cell: from -0.65 in smectite packets to -1.50 in hydromuscovite (polytype 1M) and -2.0 in muscovite (polytype 2M1). In essence, the process of bacterial streamlining of the structure of a smectite througt mixed-layer minerals (illite-smectite) to the 1M polytype, and then 2M1 is realized.

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