

## **Phosphate mineral occurrences in Lake Baikal sediments: Paleo-environment or diagenesis record.**

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We investigate the geochemistry of Lake Baikal sediments in four cores drilled on topographic hills, in the southern basin (Posolsky bank, CON01-604), in the central part (Academician Ridge, VER98-1-3 and VER98-1-14) and in the northern basin (Continent Ridge, CON01-603). Major and trace elements have been analysed by ICP-AES and ICP-MS with a sampling resolution of 10cm. The most striking feature in the major oxide distribution is the occurrence of several peaks of P<sub>2</sub>O<sub>5</sub> related to enrichment in MnO<sub>2</sub> and Fe<sub>2</sub>O<sub>3</sub>. For instance P<sub>2</sub>O<sub>5</sub> reaches up to 3% wt. relative to a mean value of 0.3 in the background sediment, MnO<sub>2</sub> presents an enrichment factor up to 6. There is no associated enrichment in any trace elements at the same levels. In the sediments, those P-Mn-Fe rich levels are related either to sparse millimetric dark concretions or to a layer (or a group of layers) defined by an alignment of numerous concretions. The concretions, isolated by >63 µm sieving, present a lamellar morphology. They are identified as Fe-phosphate phases with a variable proportion of Mn. The powder diffraction diagram is consistent with vivianite. Phosphate minerals have been previously identified as concretions or as Fe-crust in lacustrine sediments worldwide, including Baikal. However, their formation processes are not yet fully understood. We discuss the paleo-environmental implications of the occurrence of phosphate minerals in sediments. To be preserved in the sediments, the phosphate enrichments could imply one or several of the following conditions: no post-sedimentary perturbation after deposition (bioturbation), oxygenation of the water-column and the occurrence of a red ox-boundary in surficial sediments, supply of dissolved phosphorus, slow sedimentation conditions. By studying the distribution of the phosphate concretions in sedimentary columns characterised by different sedimentary conditions (mass accumulation rate, bioturbation, post-depositional disturbances or perturbations, biogenic content...), we would like to make the point on the potential of phosphate minerals as proxies for the paleo-productivity of the water-column or for sedimentary conditions related to early diagenesis.