CARBONATE PRECIPITATION UNDER THE ICE OF LAKE BALATON

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Calcite precipitation in hardwater lakes is a common phenomenon, as a result of the consumption of CO_2 by algae through photosynthesis. The mineralogical composition of the sediment of Lake Balaton is dominated by carbonate minerals that primarily formed by this biologically-influenced chemical process. Since the water of Lake Balaton is Mg-rich, the precipitating calcite contains significant and variable amount of Mg (MÜLLER & WAGNER, 1978; CSERNY, 1987). According to previous reports, “protodolomite”, a structurally disordered carbonate with dolomite-like composition occurs in the deeper layers of Balaton sediments (MÜLLER, 1970). It is unclear whether the Mg content of calcite is randomly distributed in individual particles, or distinct carbonate types occur that have specific amounts of Mg in their structures. It is also unknown whether the morphologies of carbonate grains are affected by their Mg content.

The study of pristine, freshly-precipitated calcite is difficult because the suspended calcite grains are indiscriminately filtered by various zooplankton species, and then excreted as pellets, aggregates of the original carbonate crystals and of other, non-digestible material such as diatom tests (G.-TÓTH *et al.,* 1987). These pellets are deposited on the lakebed, but can again be stirred up by wave action and turbulence in shallow Lake Balaton, re-entering the lake’s ecological cycle. Thus, the sediment contains mostly “reprocessed” carbonate mineral aggregates, the properties of which do not necessarily reflect those of the original precipitated particles.

In order to understand the structural and morphological consequences of the incorporation of Mg into the calcite that forms in Lake Balaton, we collected freshly precipitated carbonate particles in sediment traps that were placed under the ice. With this sampling setup we wished to avoid the effects of wind-driven turbulence and resuspension, and thus biological reprocessing of the sedimented material. The collected material was studied using X-ray powder diffraction (XRD) and scanning and transmission electron microscopy (SEM and TEM, respectively). Our preliminary observations indicate that the traps collected elongated, few µm-large aggregates in which the individual crystallites occurred in a consensus crystallographic orientation. In addition to the aggregates, smaller, euhedral particles (rhombohedra) were also present. Whereas the Mg/Ca ratio appeared to vary from grain to grain but remained below ~1/7 in the elongated aggregates, the Mg content was much higher in the euhedral crystals. In addition to carbonates, the sediment traps also collected clay minerals and diatoms, and the sampling vials contained a large number of copepods; thus, some biological reprocessing of the carbonates might have occurred. Further studies are in progress to understand the potential relationships between compositional and structural features of the precipitated carbonates, as well as the influence of the biota on the mineralogical character of the sediment.

Support from the EU/Hungarian grant TÁMOP-4.2.2.-B-10/1-2010-0025 is gratefully acknowledged.

References

CSERNY, T. (1987): Annual Reports of the Hungarian Geological Institute, 1985: 343–365.
G.-TÓTH, L., ZÁNKAI, N.P. & MESSNER, O.M. (1987): Hydrobiologia, 145: 323–332.
MÜLLER, G. (1970): Nature, 226: 749–750.
MÜLLER, G. & WAGNER, F. (1978): Special Publications of the International Association of Sedimentologists, 2: 57–81.