

## Calcite Bio-mineralisation by Picoplankton Cultures from Lake Lucerne

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Gold2000.E.192

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Calcite precipitation is a well known phenomenon for hard-water lakes, but the mechanisms are still the subject of investigations. Recently the bloom of picoplankton (cyanobacteria *Synechococcus*, diameter < 2µm) in Fayetteville Green Lake was observed to correlate with the onset of CaCO<sub>3</sub> precipitation (Thompson et al., 1997). The CaCO<sub>3</sub> crystals covered the outer cell wall of the organisms suggesting that the cells actively induce mineralisation.

In this study the role of picoplankton from Lake Lucerne for calcite bio-mineralisation was investigated. Precipitations were induced by adding cultures of *Mychonastes*, *Chlorella* and *Synechococcus* to supersaturated CaCO<sub>3</sub> - solutions. To gain insights into the reaction kinetics the concentrations of Ca<sup>2+</sup>, CO<sub>3</sub><sup>2-</sup> and H<sup>+</sup> were monitored using ion-selective electrodes. The morphology of the precipitated material was studied by SEM imaging and the crystal structure of the precipitated CaCO<sub>3</sub> was analysed by X-ray powder diffraction.

Precipitations occurred after an induction period of 1-3 days. During this time the rise of the pH due to the photosynthetic activity of the organisms increased CaCO<sub>3</sub> - supersaturation. After the induction period calcite or micrite precipitated. Crystals started growing from the outer membranes of the organisms indicating that the organic surface is actively involved in the formation of nuclei. Reactions were complete after 3-5 days and resulted in the precipitation of about a third of the Ca<sup>2+</sup>, CO<sub>3</sub><sup>2-</sup>.

These results clearly show the potential of picoplankton for a fast and effective induction of CaCO<sub>3</sub> - precipitation. The role of picoplankton therefore has to be considered if one aims at understanding the onset of CaCO<sub>3</sub> - precipitation in hardwater lakes.

Thompson JB, Schultze-Lam S, Beveridge TJ & Des Marais DJ, *Limnol. Oceanogr.*, **42**, 133-141, (1997).