The Effect of Variable Calcium Concentrations in Culture Media on the Diatom Species Stephanopyxis turris and Thalassiosira pseudonana

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The nano-scaled, siliceous cell walls of diatoms consist not only of silicon and oxygen, but also of calcium, iron, aluminum and zinc among other elements.[1] Understanding their role in biomineralization may help to modify biogenic silica for highly specific applications. Based on preceding studies about the aluminum uptake of diatoms[2], the calcium incorporation in the cell walls of the diatom species *Stephanopyxis turris* (*S.t.*) and *Thalassiosira pseudonana* (*T.p.*) is investigated by varying the calcium concentration in the culure medium. In initial tolerance tests, both species subsisted in media with low calcium concentrations (10% of the standard supply). *T.p.* tolerated concentrations up to 10fold the common concentration, while the growth of *S.t.* was impaired at 5fold. Within these tolerance ranges, calcium chloride is sufficiently soluble in artificial sea water. Both diatom species were treated with SDS/EDTA to remove organic material after cultivation. The whole cells and cell walls were spectroscopically characterized. Preliminary results of IR spectroscopy suggest a shift of the Si-O stretching vibration at ~1060 cm^{-1} with increasing calcium concentration to lower wave numbers in compliance to former studies of glasses.[3] The cell walls' Si/Ca elemental ratios were determined by ICP-OES; their structures were investigated using REM.

References

[1] M. Kunaschk, ″Elementanalyse und spektroskopische Untersuchungen an Diatomeenzellwänden″, Bachelor's thesis, TU Dresden (2010).

[2] S. Machill, L. Köhler, S. Ueberlein, R. Hedrich, M. Kunasch, S. Paasch, R. Schulze, E. Brunner, *BioMetals* 26(1), 141-50 (2012).

[3] P. Saravanapavan, L.L. Hench, *J. Non-Cryst. Solids* 318, 1-13 (2003).