

# *Analyses of silicon and carbon cell quota of Diatoms studied with FTIR-spectroscopy*

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**Introduction:** Diatoms dominate phytoplankton blooms in the ocean and hence play a key role in aquatic ecosystems and the global carbon cycle. These silica-shelled algae mainly constitute the “biological carbon pump” that draws down carbon dioxide from the atmosphere and exports it to ocean’s sediments (Yamaguchi et al., 2002). Important parameters in ecosystem models are the primary production and biomass of phytoplankton. Here we show results on C/Si ratios and C, Si contents/cell of three ecologically relevant species using microscope-coupled FTIR-spectroscopy.

**Materials and Methods:** FTIR-spectra were recorded from cells of *T. weissflogii*, *C. meneghiniana* and *S. costatum* cultivated in media containing 0.35 – 0.01 mM Si. Cells were washed and dried for 20 min at 40 °C on a ZnSe-crystal before measurement. The used FTIR-system and applied conditions can be found elsewhere (Stehfest et al., 2004). Reference values were measured using ICP-AES and MS.

**Results and Conclusions:** FTIR-spectra comprised the vibrational characters of all cell constituents. Typical bands at 1075 and 800 cm<sup>-1</sup> indicative of silicate were present in all spectra of the different diatoms. This region was used to create a chemometric model comparing Si concentration-dependent changes of spectral features with the reference values. The same was done for the carbon content/cell using two spectral region between 3000 – 1300 cm<sup>-1</sup>. Actually, silicon content/cell reached 2 – 40 pg whereas carbon content varied between 10 – 200 pg/cell. The obtained models showed high correlations and were tested by employing cross validations. Since the three species investigated could be combined in one model, species-independent analyses were carried out. We could also use microscope-coupled FTIR-spectroscopy for species specific analysis. We conclude that FTIR-spectroscopy is a suitable method for rapid investigation of the elemental composition of small cell groups or single cells of diatoms.

## **References:**

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