# *Analyzing the silica content in diatoms via FTIR spectroscopy*

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FTIR spectroscopy has emerged as a versatile method to analyze phytoplankton samples in the last decade. It is used to study the composition of cellular compounds by band comparison or the quantitative determination of proteins, carbohydrates and lipids [1, 2 & 3] and rosmarinic acid [4]. However, as carbohydrates and silica show a largely overlapping absorption, a quantitative analysis of silicious species such as diatoms proved to be difficult. Since diatoms depend on Si for growth due to their frustule and being a major phytoplankton group which contributes to the phytoplankton primary productivity to 50 %, we tested the application of FTIR spectroscopy methods even under the Si-background.
Therefore, the two diatom species *Cyclotella meneghiniana* and *Skeletonema costatum* were grown under Si replete and Si limited steady state conditions. This caused an adaptation of the cultures to different Si availabilities, leading to cells of 3.5 % to 12 % Si per dry weight and a Si:C ratio of 0.06 to 0.34 $w*w^{-1}$. The collected data was used to generate PLS (partial least square) methods from FTIR cell spectra which are able to predict the amount of Si per dry weight and the Si:C ratios of these two species separately. Furthermore, data of cultures grown in batch cultures and of two other diatom species (*Thalassiosira weisflogii*, *Phaeodactylum tricornutum*) were added to create PLS methods which predict Si:C ratio for multiple species. Testing these methods by five independent data sets showed that this approach delivers solid results.

References

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