Methodological assessment of micro-FTIR as a tool for the characterization of macromolecular dinoflagellate cyst compositions and chemotaxonomy

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Over the last decades, Fourier-Transformed Infrared Spectroscopy (FTIR) has grown to be widely-used method for assessing the geochemical composition of a large array of palynomorphs, as it is non-destructive, relatively fast and cheap. Technological innovations during this period allow for measurement of single specimens, marking an evolution from macro- to micro-scale analysis.

This study assesses the viability and reproducibility of FTIR-measurements in determining the macromolecular composition of individual dinoflagellate cysts via a series of methodological tests. These include alteration of the sample preparation protocol, measurement of pure polysaccharide standards and comparison of several spectral gathering methods: Au-mirror (reflection), Si-wafer (transmission) and ATR (total internal reflection). The backbone for developing this methodological framework is a spectral library of a statistically significant magnitude, containing a multitude of recent dinoflagellate cyst species (and other palynomorphs by extension) from several localities around the globe.

A micro-FTIR study by Bogus et al. (2014) first suggested that dinoflagellate cysts can be classified into one of two groups, based on their feeding strategy (autotrophs vs. heterotrophs). Ultimately, this study aims to further explore the concept of chemical dinocyst variability beyond the nutritional level and assesses the existence of spectral signatures on a genus and/or species level, which could allow for objective chemotaxonomy.

References

Bogus, K., Mertens, K.N., Lauwaert, J., Harding, I.C., Vrielinck, H., Zonneveld, K.A.F., Versteegh, G.J.M., 2014. Differences in the chemical composition of organic-walled dinoflagellate resting cysts from phototrophic and heterotrophic dinoflagellates. J*. Phycol.* 50, 254–266.