

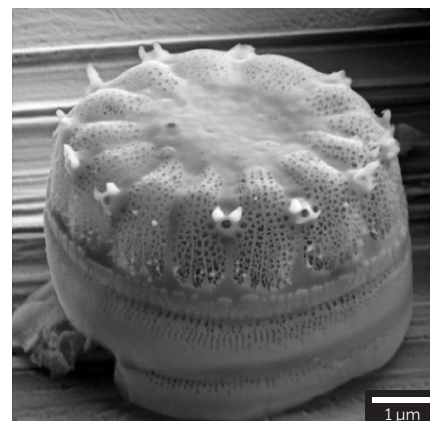
Elemental Analysis of Diatom Cell walls using a FIB-SEM/TOF-SIMS

Diatoms are worldwide abundant unicellular microalgae (Fig.1). Their fossilized remains are the main component of diatomite, a mineral widely utilized in many different industries as an absorbent or additive. The chemical composition of the shells is critical for the properties of the final product. Therefore, there is a huge need to analyze the elemental distribution in the original diatoms. TESCAN dual beam systems coupled with a Time-of-Flight Secondary Ion Mass Spectrometry (TOF-SIMS) analyzer provide a new way of studying elemental composition and bring new insight into the architecture of these unique microalgae.

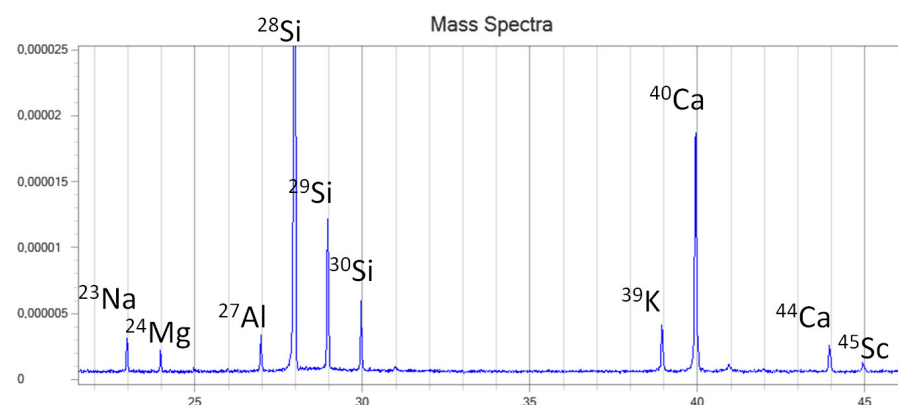
■ TOF-SIMS analysis

We used a TOF-SIMS analyzer integrated into a TESCAN LYRA3 FIB-SEM to obtain high resolution images and elemental distribution maps. Fig.2. shows an individual diatom with a distribution of oxygen isotope. For all measurements, focused Ga⁺ ions were used for the sample ionization. The complete TOF-SIMS mass spectrum was acquired in less than 3 minutes (Fig.3).

The FIB-SEM/TOF-SIMS has been demonstrated as a analytical tool for a fast and precise structural and chemical analysis of diatoms.



▲ Fig.1: SEM image of a diatom.



▲ Fig.3: Mass spectra of isotopes detected in a positive ion mode.

■ High-performance Ga⁺ FIB column

TOF-SIMS analysis highly depends on the currents and resolution of the FIB column. The Cobra FIB provides excellent resolution over a broad range of currents, which makes it an ideal solution for various life science applications.

■ Advantages of Cobra FIB column

- High stability Ga⁺ source
- Probe current: 1 pA - 50 nA
- Resolution: < 2.5 nm at 30 kV
- Excellent performance at low kV

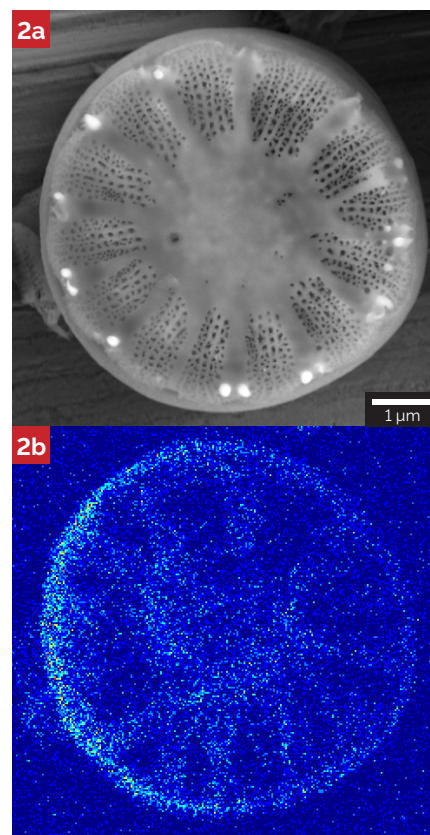
Convenient Ga⁺ FIB-SEM systems

■ LYRA3 FIB-SEM

- Extreme versatility
- Easy to use
- Large Field of view
- Excellent imaging and milling performance

■ GAIA3 FIB-SEM

- Delicate samples investigation
- Triglav™: UHR SEM electron column
- Advanced detection system for low kV imaging
- Ultimate precision in nanomachining



▲ Fig.2: SEM image of the analyzed diatom (a) and a distribution map of an oxygen isotope 16O (b).