



Novel mass spectrometry techniques for 2D and 3D elemental and molecular imaging

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We have applied time-of-flight secondary ion mass spectrometry (ToF-SIMS) and laser postionization secondary neutral mass spectrometry (Laser-SNMS) (a) to image targeted compounds and intrinsic elements and molecules with subcellular resolution in different types of biological samples, (b) to examine different states of biomineralization *in vitro*, (c) to analyze fibronectin and collagen type I and other proteins in a model system, and (d) to obtain 3D molecular images from foraminifera.

In our presentation, we will discuss the possibilities and limitations of ToF-SIMS and Laser-SNMS for imaging elements and molecules in biological samples. We will especially discuss various sample preparation techniques, possibilities for enhancing detection sensitivity, and various ways of obtaining 3D molecular images from biological samples.

Our data will show that both TOF-SIMS and Laser-SNMS are capable of imaging elements and molecules in complex biological samples and that they could be very valuable tools for advancing the understanding of the biomineralization process and applications in life sciences.