TOF-SIMS Imaging of *Arabidopsis thaliana* Organs and Differentiation of Epicuticular Waxes

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TOF-SIMS has emerged as an important tool for imaging mass spectrometry of biological samples due to its unique capability to detect molecular ion fragments and elemental ions at sub-micron spatial resolution and without the sample treatments required by e.g. the MALDI technique. For many biological specimens, the ability to image samples having a large degree of surface topography is also highly desired. The resulting elemental and molecular images provide important information regarding the composition of biointerfaces, for example between plant tissues and their natural environment. This TOF-SIMS study involves the differentiation and characterization of epicuticular waxes present at the surfaces of *Arabidopsis thaliana* organs including the flower, stem, adaxial (top) leaf surface and the abaxial (bottom) leaf surface.

High spatial resolution images of a flower petal and of an abaxial leaf surface, revealing both spores and respiratory pores, respectively, demonstrate the capability of TOF-SIMS to image molecular ion fragments with a spatial resolution of < 0.3 microns. Total ion images, and molecular fragment ion images of epicuticular wax components, demonstrate the capability to image entire organ surfaces without topographical artifacts. High mass range spectra in both the positive and negative secondary ion polarities reveal that the epicuticular surface of each *Arabidopsis thaliana* organ is comprised of distinct wax components. Mass spectra acquired from specialized cells forming the 1 µm x 7 µm respiratory pores of the abaxial leaf surface indicate that, even within a single organ surface, the epicuticular wax composition may vary. The differences in wax composition on each of the interrogated organs of *Arabidopsis thaliana* will be presented and discussed. Structural assignments for characteristic mass spectrometric features related to the wax composition will also be presented and discussed.