

New Instrumentation and Methodologies for SIMS Imaging of Cells and Tissue

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Secondary ion mass spectrometry is a powerful analytical tool for characterisation of a wide range of samples. Historically detection of molecular type species was limited to a fraction of the upper most surface of the analyte. However when using new polyatomic primary ion beams, particularly C_{60} , many samples have been shown to provide stable molecular signal under continued primary ion bombardment. The practical implications are that molecular depth profiling is now possible and when coupled to the imaging capabilities of SIMS 3D mass spectrometric imaging becomes a reality. In 2D imaging signal levels and image contrast can be improved by consuming more of the sample.

Unfortunately if one wants to perform these types of analyses on a conventional time-of-flight instrument the associated duty cycle can make the experiment unfeasible within a practical time frame.

We have worked in collaboration with Ionoptika Ltd. To develop a new breed of ToF-SIMS instrument that decouples the mass spectrometry from the ion formation process thus removing the need to pulse the primary ion beam and greatly increasing the duty cycle. We are now exploring methods for imaging cells and tissue making full use of the capabilities of polyatomic ion beams along with optimised sample preparation and handling including cryogenic preservation of single cells for imaging. Results from 2 and 3D bio-imaging SIMS will be presented.

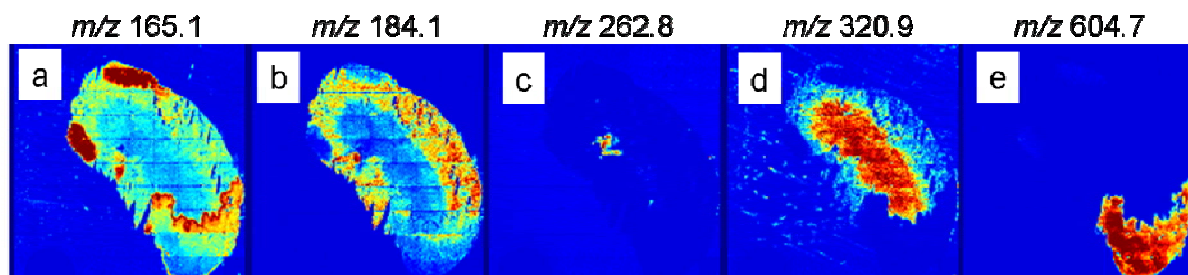


Figure: SIMS Imaging of rat kidney section using C_{60} on the J105 3D Chemical Imager.