Contribution ID: **43** Type: **Poster**

P69 - Calibration and application of molecular imaging with MeV SIMS in positive and negative mode on plant tissue

Friday, 11 July 2014 13:00 (1 hour)

The introduction of new biomolecular imaging techniques into biomedical research is of high importance for improving our understanding of living organisms and their processes. These processes are often governed by large molecules, which are undergoing relocation and chemical modifications. The ability to provide their molecular maps can give us an excellent insight into the organisms'metabolism.
At the nuclear microprobe of Jožef Stefan Institute, the established sample preparation protocols and micro-PIXE method is optimized in order to provide quantitative elemental maps in biological tissue [1]. To extend our analytical capabilities with molecular imaging, a linear Time-Of-Flight mass spectrometer for MeV Secondary Ion Mass Spectrometry (MeV SIMS) spectrometer was constructed and incrementally added to the existing detection setups. A 5.8 MeV 35Cl6+ beam was focused to the size of 20 μm × 20 μm and pulsed to provide start signal for the time measurement. Ions were detected with double stack microchannel plate detector. The achieved spectrometer mass resolution of 500 is dominantly determined by the duration of the primary ion pulse.
For calibration purposes, we prepared several reference samples. The cholesterol standard solution was left to dry on Si wafer, opposed to Arginine and Glycine amino acids solution which were spin-coated on the Si wafer. We present the calibration spectra and discuss the issues connected with the beam pulsing and secondary ion detection [2]. To demonstrate the imaging capabilities, series of thin plant tissue cuttings were prepared by standard shock-freezing and freeze-drying protocol [3] and deposited on the Si wafer. By inverting the target bias voltage the system allows the detection of positively as well as negatively charged secondary ions. Maps acquired in the negative ion mode are compared with those acquired in positive ion mode. To simplify the sample positioning and to identify the sample morphology, the MeV SIMS maps were correlated with the maps acquired by heavy ion induced X-ray emission.

[1] P. Pongrac et al., Journal of the Royal Society interface 10 (2013) no 84.
[2] L. Jeromel et al., accepted for publication in Nucl. Instr. Meth. Phys. B
[3] K. Vogel-Mikuš et al., Plant Cell Environment 31 (2008), 1470–1483

Primary author: Mr JEROMEL, Luka (Jožef Stefan Institute, Jamova 39, SI-1000 Ljubljana, Slovenia)

Co-authors: Dr VOGEL MIKUŠ, Katarina (University of Ljubljana, Biotechnical faculty, Dept. of biology, Večna pot 11, SI-1000 Ljubljana, Slovenia); Dr BUČAR, Klemen (Jožef Stefan Institute, Jamova 39, SI-1000 Ljubljana, Slovenia); Mrs OGRINC POTOČNIK, Nina (Jožef Stefan Institute, Jamova 39, SI-1000 Ljubljana, Slovenia); Dr PELICON, Primož (Jožef Stefan Institute, Jamova 39, SI-1000 Ljubljana, Slovenia); Mr VAVPETIČ, Primož (Jožef Stefan Institute, Jamova 39, SI-1000 Ljubljana, Slovenia); Mr RUPNIK, Zdravko (Jožef Stefan Institute, Jamova 39, SI-1000 Ljubljana, Slovenia); Dr SIKETIĆ, Zdravko (Ruđer Bošković Institute, P.O.Box 180, 10000 Zagreb, Croatia)

Presenter: Mr JEROMEL, Luka (Jožef Stefan Institute, Jamova 39, SI-1000 Ljubljana, Slovenia)

Session Classification: Poster Session with Cheese and Wine