

## DEVELOPMENT AND APPLICATIONS OF THE SECONDARY ION MASS SPECTROMETRY WITH MEV IONS (MEV SIMS) TECHNIQUE AT THE RBI ACCELERATOR

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In 2013, the first experimental setup for the Secondary Ion Mass Spectrometry with MeV ions was installed at the RBI heavy ion microprobe [1]. The setup is based on a linear TOF spectrometer and a pulsed ion beam. It is the first accelerator based IBA technique at the RBI that can provide information about molecular composition of the analysed samples.

MeV SIMS is a surface sensitive technique where molecules are desorbed only from the uppermost layers. Use of MeV instead of keV ions ensures less fragmentation and detection of intact molecules, which facilitates the interpretation of the obtained mass spectra. So far, we have successfully applied MeV SIMS in biology for the molecular imaging of liver tissue and single cells at the submicron level [2], in cultural heritage for the identification and 2D imaging of synthetic organic pigments [3], and in forensics for the determination of the deposition order of different writing tools [4].

To overcome some of the limitations related with ion beam handling, as well as with the maximal sample sizes, a capillary microprobe was recently built at the zero-degree beam line [5] where heavy ions are collimated to the micron dimensions with a conical glass capillary. Also, a reflectron type TOF spectrometer was used, allowing for much better mass resolution than a linear TOF. As the secondary molecular ion yield strongly depends on the electronic stopping power, it is clear that the use of heavier ions, such as I or Au, with energies up to 30 MeV will make the technique more sensitive. The most important results obtained by both TOF setups will be presented and discussed.

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