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P14 - Progress in development and application of MeV TOF-SIMS technique at the Zagreb Heavy Ion Microbeam Facility

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In 2012, ToF-SIMS setup is constructed and installed at the Heavy Ion Microbeam Facility at the Ruđer Bošković Institute in Zagreb. In this method, secondary molecular ions are extracted from the sample after impact of heavy MeV ions, using an acceleration potential difference between the sample surface and a grounded extractor (± 5 kV). Tip of the extractor is positioned perpendicular to the sample surface at a distance of several mm. Dedicated Multi-Stop Time to Digital Converter (TDC) pulse processing electronics have been developed based on the FPGA card, enabling microbeam-scanning control, incoming ion microbeam pulsing and molecular mapping.

Imaging of heavy molecules (>300 Da) with submicron resolution is possible due to the enhanced yield of intact secondary molecular ions desorbed by MeV ions. Considering that this technique is actually the first among all ion beam analysis techniques able to provide information about molecular content of the sample, application perspectives seem to be extremely wide. Initial measurements have shown excellent sensitivity which was demonstrated in the analyses of several organic molecules [1].

In this work further development concerning enhancement and application of the method will be shown. Heavy ion beams from both RBI tandem accelerators as well as different focusing arrangements have been tested. Also, dedicated system for charge normalization, based on the PiN diode, has been developed.

We applied MeV TOF-SIMS for the analysis of modern paint materials. Degradation (stability) of the paints under different aging conditions is studied. In addition, first measurements and application of the MeV TOF-SIMS technique on the investigation of diabetes disease will be shown.

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[1] T. Tadić, I. B. Radović, Z. Siketić, D. D. Cosic, N. Skukan, M. Jakšić and J. Matsuo, Development of a TOF SIMS setup at the Zagreb Heavy Ion Microbeam Facility, accepted to NIMB

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