

E I N L A D U N G

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V O R T R A G

von

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**Ion Beam Analysis (IBA) methods at the
Ruđer Bošković Institute in Zagreb
with a special emphasis on
cultural heritage applications**

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Ion Beam Analysis (IBA) methods at the Ruđer Bošković Institute in Zagreb with a special emphasis on cultural heritage applications

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Abstract

The Laboratory for ion beam interaction of the Ruđer Bošković Institute in Zagreb, Croatia, will be presented. It is equipped with 6 MV Tandem Van de Graaff and 1 MV HV Europe Tandatron accelerator. During the last twenty years many different ion beam analysis (IBA) methods were developed using light and heavy MeV ions on nine different beam lines. The most often used methods are PIXE (Particle Induced X-Ray Emission), RBS (Rutherford Backscattering Spectroscopy), ERDA (Elastic Recoil Detection Analysis) and PIGE (Particle Induced γ -Ray Emission). Those methods are sensitive, fast and non-destructive and can give us information on the elemental or isotopic composition of samples as well as related depth distribution. Most of them can be used with a broad ion beam or using ion beams focused to micrometer dimensions. If microbeam is used, information on 2D or even 3D distribution of elements can be obtained.

Some applications of available IBA techniques to the analysis of cultural heritage objects will be shown. Part of the talk will be devoted to the newly developed secondary ion mass spectrometry method using MeV heavy ions (MeV SIMS) which is the first IBA method in our laboratory devoted to mass spectrometry. MeV SIMS is attached to the heavy ion microprobe and is having ability for mapping molecules up to 1000 Da with micrometer lateral resolution. Potential of this novel technique for molecular mapping of different kind of samples (biological, cultural heritage, etc.) will be discussed.

CV

Dr. Iva Bogdanović Radović is Senior Research Associate in the Laboratory for Ion Beam Interactions. She graduated in 1991 and started to work at the Ruđer Bošković Institute in Zagreb. At the beginning her work was connected with x-ray fluorescence (XRF) techniques but her interests moved towards the development and application of different Ion Beam Analysis (IBA) methods using focused MeV proton microbeam, especially Particle Induced X-Ray Emission (PIXE), Rutherford Backscattering Spectrometry (RBS), Scanning Transmission Ion Microscopy (STIM) and Elastic Recoil Detection Analysis (ERDA).

Dr. Iva Bogdanović Radović obtained her PhD in Nuclear Physics from the Faculty of Natural Sciences and Mathematics, University of Zagreb in 1997. In 1999 she was granted with a Lise Meitner Postdoctoral fellowship from the Austrian Science Foundation at the Institute of Experimental Physics, Johannes Kepler Universität, Linz, in the group of Prof. Dr. Oswald Benka. The topic of her postdoctoral work was connected with the application of Ion Induced Electron Emission Elastic Recoil Detection Analysis (IEE ERDA. After returning back to Ruđer Bošković Institute in 2000, she implemented IEE ERDA using focused MeV ion beams for 3D imaging of hydrogen and its isotopes at the nuclear microprobe in Zagreb. Also she developed sensitive method for light element analysis based on coincident elastic scattering.

Dr. Bogdanović Radović spent several shorter scientific visits at the University of Oxford, UK, Atominstytut der Österreichischen Universitäten, Vienna, Technische Universität München, Garching and Istituto Nazionale di Fisica Nucleare; Sezione di Firenze, Dipartimento di Fisica, Firenze.

She is author or co-author on 92 scientific papers cited by Current Contents, with more than 500 citations. Dr. Bogdanović Radović presented her scientific results on many international conferences, through invited and contributed talks or posters as well as she participated in the organization of two international conferences “9th International Conference on Nuclear Microprobe Technology and Applications” (in 2004) and “2th International Symposium on Utilization of Accelerators”(in 2005).

During her scientific career she was principal investigator or coworker on several projects funded by EU, IAEA and Croatian Ministry of Science, Education and Sports. Today her research interest is focused on two main topics: modification of materials using heavy MeV ions (e.g. ion beam assisted formation of semiconductor quantum dots in isolating matrices) and further development of new IBA techniques. One of them is Secondary Ion Mass Spectrometry with MeV Ions (MeV SIMS), which is presently available at only four heavy ion microprobes worldwide (Kyoto, Surrey, Ljubljana and Zagreb). Recently she was granted a Unity Through Knowledge (UKF) project together with Dr. Dubravka Jembrih Simbürger from the Academy of Fine Arts, Vienna. The title of their project is “Study of modern paint materials and their stability using MeV SIMS and other analytical techniques”.