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Ambient pressure molecular concentration mapping at surfaces using MeV-secondary ion mass (MeV-SIMS)

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In the 1970s it was shown that MeV heavy ions efficiently sputter insulating targets. An analysis technique based on this, Plasma Desorption Mass Spectrometry (PDMS), employed Cf fission fragments as a source of MeV heavy ions. The technique was able to desorb large molecular secondary ions (>10kDa) from solid surfaces, which at the time was not possible with other mass spectrometry techniques. In the 1980s, however, Laser Desorption techniques (such as MALDI) were also being demonstrated, which didn't require the presence of radioactive material or an accelerator. Consequently PDMS was all but forgotten. There has been a resurgence of interest in PDMS (renamed MeV-SIMS), when it was shown that a focused ion beam could be used to produce images with a much higher spatial resolution than is currently possible with e.g. MALDI. It was also been demonstrated that the technique can be performed simultaneously with PIXE measurements. One of the limitations of ionization techniques is the effects of the matrix on the secondary ion yield which can make even relative measurements difficult. The use of the elemental signals removes some ambiguity. New equipment being commissioned will be described which will allow simultaneous MeV-SIMS and PIXE to be collected in full ambient pressures with a micron beam resolution. Spectra and images taken for the first time in this scheme at fully ambient pressure are presented to demonstrate the potential of this new instrument.

Biography

Roger Webb completed his PhD from Salford University and pursued Postdoctoral studies at the Naval Postgraduate School in Monterey, Ca, USA. He is now the Director of the Surrey Ion Beam Centre, the National Centre for Ion Beam Applications in the UK. He has published more than 250 papers in reputed journals and has served on Editorial Board Member for a number of journals and is a member of the scientific program committees of a number of international conferences.

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