

Applications of SIMS and Focused Ion Beam SIMS in Materials Science

Speaker: Dr David S McPhail
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Venue: Blk S13, Level M, Room 11, Physics Conference Room,
Department of Physics, Faculty of Science, NUS

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Time: 3.00pm – 4.00pm



Abstract:

Secondary Ion Mass Spectrometry (SIMS) has traditionally been used to provide information on dopant distributions in semiconducting matrices. However the technique is now being applied to a very wide range of materials problems spanning many different technological areas including bio-materials, aerospace, glass, fuel cells and even materials conservation. In this talk I will give an overview of the SIMS technique and will show some examples of the breadth of applications to which it can be applied. The concept of Focused Ion Beam (FIB) SIMS is a recent one and I will spend some time showing examples of FIB SIMS analysis. FIB can be used both for materials processing and materials analysis, since the ion beam used in the FIB milling process generates several potentially useful analytical signals such as electrons, ions and photons. Thus, several different modes of FIB based analysis are possible, depending on the detectors placed within the instrument. The examples of FIB SIMS analyses will include micrometeorites and micrometeorite impact sites on metal foils, an oxide ceramic for a solid oxide fuel cell ($\text{La}_{0.9}\text{Sr}_{0.1}\text{CoO}_3$), glass, stainless steel, zeolite beads, superconducting and semiconducting multilayers and aerospace alloys.

Profile:

David McPhail is a Senior Lecturer in the Department of Materials at Imperial College and he is the postgraduate tutor in the department. He is a specialist in Secondary Ion Mass Spectrometry (SIMS). In his research he is using surface analysis both for fundamental studies and for the characterisation of a wide range of materials including thin film semiconducting and superconducting structures, aerospace alloys, ceramics, glasses and bio-materials. As well as studying modern materials he is also interested in conservation science and has collaborations with local museums and colleges of art. He has over one hundred and thirty publications in the scientific literature. He is the manager of the surface analysis facility in the Materials department at Imperial College, a facility that includes an ultra-low energy depth profiling SIMS instrument (Cameca), A FIB SIMS instrument (FEI) and a mini-SIMS (Millbrook).

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