

Seminar

Monday 18 July 2011

11.00 am Room 531

Dr Claire Vallance

Department of Chemistry, University of Oxford, Chemistry Research Laboratory

Time-of-flight imaging mass spectrometry

Modern state-of-the-art mass spectrometry has found a bewildering array of applications, covering areas as diverse as the identification and structural analysis of proteins, peptides and oligonucleotides; drug discovery, pharmacokinetics; breath gas monitoring; quality control; reaction kinetics measurements; quantitation of complex chemical mixtures; and geochemical and archaeological dating. In the important emerging field of proteomics, mass spectrometry is literally driving biological discovery, and there is an ever increasing demand for innovation in instrument design that will allow molecular structures to be probed in more detail.

One of our current projects involves the development of a 'next-generation' time-of-flight mass spectrometer. In addition to acquiring the conventional mass spectrum, the new spectrometer records the complete velocity or spatial distribution of the ions at their point of formation. In velocity imaging mode this opens up exciting new avenues in studying the fragmentation dynamics of large molecules, potentially yielding new mass spectrometric techniques for molecular structure determination. In spatial imaging mode the instrument will be capable of recording chemically resolved images of surfaces with micron or sub-micron spatial resolution. Potential applications are wide-ranging, and include high-throughput parallelised mass spectrometry, surface characterisation and tissue imaging. The spectrometer utilises the technique of velocity/spatial- map imaging, an innovation that has captured the imagination of the international reaction dynamics community, and which holds as-yet untapped potential for many other areas of both fundamental and applied science.

In this talk I will give an overview of our progress so far, provide some warnings to the uninitiated regarding the trials and tribulations of working with VUV laser systems, ultra fast image sensors, and particle physicists, and show some (really rather encouraging) early images from our first prototype spectrometers.