



Flagship: PHI TRIFT V nanoToF ToF-SIMS

Time-of-flight secondary ion mass spectrometer (ToF-SIMS) for surface analysis and depth profiling

The PHI TRIFT V nanoToF ToF-SIMS is able to conduct surface analysis at the nanometre level for the identification and mapping of elements and molecules. This instrument is unique in its ability to combine sensitivity, spatial resolution and chemical specificity with parallel detection of atomic and molecular species.

Contact and information

The South Australian Regional Facility (SARF)

Ian Wark Research Institute
University of South Australia
Mawson Lakes, SA 5095
Australia

T: +61 8 8302 3703
F: +61 8 8302 3683
W: www.unisa.edu.au/iwri

SOUTH AUSTRALIAN REGIONAL FACILITY (SARF)



University of
South Australia



Scientific Drivers

The ability to analyse components within only a few atomic layers of a surface is extremely useful in many fields of surface-modification chemistry. The PHI TRIFT V nanoToF ToF-SIMS instrument enables this level of precision and it is used in studies of semi-conductors, catalyst surfaces, polymers, biomaterials, pharmaceuticals, and paints and other surface coatings.

Time-of-flight secondary ion mass spectroscopy (ToF-SIMS) is essentially a non-destructive technique where a pulsed primary ion beam is focused onto the specimen to bring about desorption and ionisation of atoms or molecules from the surface. The ejected material is then identified on the basis of its mass, by using the time of flight from the surface to the detector. It is particularly useful when information is needed about just the top 1–2 nm of a sample.

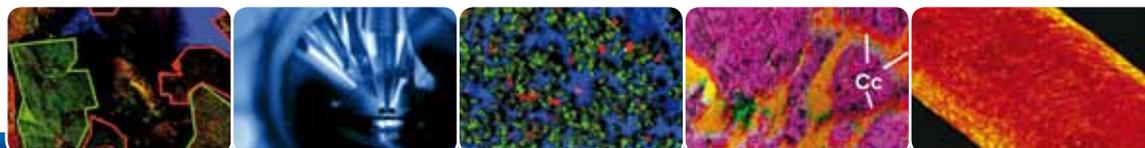
The PHI TRIFT V nanoToF ToF-SIMS has detection limits in the parts-per-million to parts-per-billion range, making it able to detect trace impurities and contamination of surfaces. This is especially important in the fields of surface modification and surface characterisation.

It can be used to characterise both conductive and insulating samples, and is able to detect all elements and isotopes. Organic species with a molecular mass up to approximately 2000 can be detected and identified making it an extremely powerful tool for organic chemists to use when examining surfaces coated with organic molecules.

As well as identification of elements and molecules, this instrument can also create 2-D and 3-D images, a feature ideal for depth profiling – looking at changes in composition in the uppermost layers of a specimen. Depth profiles are created by the progressive action of the ion beam over the surface to remove layer after layer of the material and the analysis of the spectra after each successive pass.

Some of the research the ToF-SIMS enables is:

- Surface modification and characterisation for applications in biotechnology e.g. understanding the surface properties of cells.
- Surface modification for applications of novel drug delivery.
- Advanced characterisation of materials such as metals, paints, ceramics, coatings and thin films.



Capabilities and the National Research Capacity

The PHI TRIFT V nanoToF ToF-SIMS provides a research capability unique in Australia. This instrument combines TRIFT analyser performance, flexible sample handling and high-performance ion-gun options that enable progress in a wide range of research areas.

The instrument is equipped with four ion guns that can be selected according to the requirements of the analysis. The key novel feature is the 20 keV C_{60} ion gun, the first of its kind in Australia. This gun opens up unprecedented capability for the analysis of organic, polymeric, and biological samples. It enables mass spectrometry at much higher mass ranges than other ion guns, and it is the only ion gun that can perform depth profiling of such samples. In addition, a 30 keV Au^+ liquid-metal

ion gun provides high spatial and mass resolution, and a Cs^+ ion gun provides higher primary ion currents for trace elemental analysis and rapid analysis of metals, ceramics and minerals. A 5 keV Ar/O_2 gas sputter ion gun is also fitted, providing high-sensitivity positive-ion depth profiling as well as providing a low-voltage ion source (working in tandem with a low-voltage electron gun) for the dual-beam charge neutralisation.

Hot and cold stages, along with a custom preparation chamber, also extend its capabilities, making the PHI TRIFT V nanoToF ToF-SIMS a state-of-the-art instrument. With support and access provided by the Ian Wark Research Institute's expert scientific and administrative staff, the AMMRF is able to provide a unique and exciting research tool for all Australian researchers.

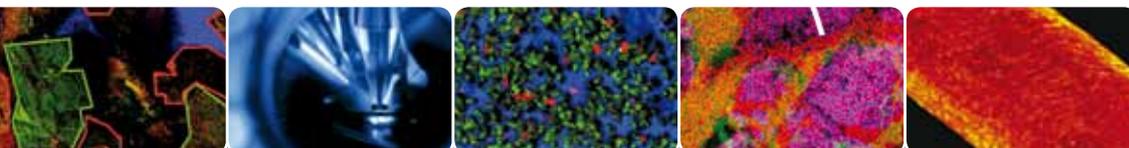
SOUTH AUSTRALIAN REGIONAL FACILITY (SARF)



University of
South Australia



FLINDERS
UNIVERSITY
ADELAIDE
AUSTRALIA



Australian Microscopy & Microanalysis
Research Facility (AMMRF)
Headquarters

Australian Key Centre for
Microscopy and Microanalysis
Madsen Building, F09
The University of Sydney
NSW 2006
Australia

T: +61 2 9351 2351
F: +61 2 9351 7682
E: info@ammrf.org.au