Contribution ID : **60** Type : **Talk (remote)**

Australia's ion microbeam facility and capability for space and medical applications

Wednesday, 12 April 2023 16:20 (20)

For 35 years, the Centre for Accelerator Science (CAS) of the Australian Nuclear Science and Technology Organisation (ANSTO) is a national state-of-art facility for applied accelerator science, providing world-leading accelerator mass spectrometry (AMS) and ion beam analysis (IBA). Two accelerators 10 MV Van de Graaff ANTARES and 6 MV Pelletron tandem SIRIUS are equipped with 5 sources to accelerate mono-energetic light and heavy ions up to 100 MeV, into 9 different beamlines which serve a large variety of application.
Two beamlines, one on each accelerator, house the unique heavy ion nuclear microprobes (HIMP) in Australia capable to focus the ion beam down to 500 nm spot size. The microprobe lens systems supplied by Oxford Microbeams Ltd consist of a powerful magnetic quadrupole triplet with high focusing power (up to ME/q2=150 MeV amu) and a scanning coil for rapid raster scanning of the beam.
Two vacuum chambers at the end-stations host piezoelectric XYZR micro-manipulators for sample alignment, high resolution telecentric cameras and microscopes for innovative imaging systems and a variety of detectors. To overcome limitations encountered while performing tests in vacuum, an additional "add-on" enclosed ambient chamber was commissioned in 2019 on the ANTARES HIMP, representing the first Australian microbeam facility in air. The so-called external chamber has the following advantages: i) ease of handling the sample with no limits to the dimension of the sample itself, ii) no charging effects in insulating materials, iii) more effective target heat dissipation, iv) sampling is not required, v) reduction in time spent pressurizing and depressurizing, and vi) option to irradiate biological living samples without compromising them.
Both ANTARES and SIRIUS accelerators are available for users from the industry and academia, to perform precision irradiation in several areas such as advanced materials, novel detectors and semiconductors, space radiation effects, radiobiology and medical application for quality assurance.
This talk will describe the CAS accelerator capabilities on the SIRIUS and ANTARES, particularly focusing on the accelerator technologies available for users for space radiation effects testing of electronics, shielding materials, and photovoltaic technologies. The radiation-induced damages testing capabilities on biological samples, and novel detector applicable to space dosimetry and particle therapy quality assurance will be discussed.
This presentation will provide an overview of the advanced capabilities of the CAS accelerators SIRIUS and ANTARES. The focus will be on the accelerator technologies that users can utilize to test the effects of space radiation on various materials, including electronic components, shielding materials, and photovoltaic technologies. Additionally, the presentation will cover the capabilities of the CAS accelerators for testing radiation-induced damages on biological samples and novel detectors for space dosimetry and particle therapy quality assurance purposes.

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Session Classification : Room 1 (Laby Theatre)

Track Classification : WG3: Accelerator technologies for industrial & medical applications