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Design and Construction of New Hot Cells and Micro-Machining/EDM Facilities at ANSTO

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The Australian Nuclear Science and Technology Organisation (ANSTO) has operated research reactors since the late 1950s. The OPAL reactor was commissioned in 2007 and is used as a source of neutrons for medicine, provision of beams for research, silicon irradiation, NAA/DNAA and the effects of neutron irradiation on structural materials. While ANSTO has extensive hot cell facilities on site these are mainly used for the production of medical isotopes or reactor maintenance activities. Additional capability was required for the examination and testing of material from the OPAL materials surveillance program and from research programs aimed at monitoring changes in structural materials for advanced nuclear power generation systems. The purpose of the surveillance program is to monitor changes in the properties of OPAL's core materials; principally zirconium and aluminium alloys, and to ensure that the changes are as expected.
ANSTO undertook an extensive review of hot cell facilities internationally and put out a tender for construction. This was awarded to Robatel Industries of France. An additional and essential part of the facility was the capability to undertake machining of active materials, in order to convert them into suitable test specimens. Several options were explored with the final contract being awarded to Viteris Technologies for the development of their micro-machining/electro discharge machining (EDM) device for hot cell operation.
This paper presents the overall design of the facility and a detailed examination of the micro-machining/EDM centre and describes the actions undertaken to convert a selection of retired reactor components into test samples such as "dog-bone"tensile specimens, compact tension fracture specimens and small punch and TEM discs. The activity of the samples will be very high, with samples of zirconium alloy irradiated to a fluence of up to 4 x 1022 n/cm2 (E > 1 MeV) being prepared (the cells are designed to contain up to ˜200 GBq of Co60 each).

Summary

ANSTO is Australia's national nuclear research organisation. It operates one research reactor, OPAL, and has recently constructed new hot cells for undertaking examination and testing of radioactive materials. A new in-cell micro-machining/EDM device has been designed and constructed by Viteris Technologies to provide the means of sectioning active material from the reactor or research programs to provide small test samples.

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