

McMaster's Centre for Advanced Nuclear Systems

The Centre for Advanced Nuclear Systems (CANS) is a regional research centre unlike any other at a university worldwide. The Centre provides a unique world-class capability to advance research in three focus areas:

- 1) nuclear materials,
- 2) nuclear safety thermalhydraulic behavior, and
- 3) health physics.

Funding to establish the facility was obtained as grants awarded in 2009 by the Canada Foundation for Innovation (CFI) – New Infrastructure Fund (NIF) and the Ontario Ministry of Research and Innovation (MRI). The total budgeted cost is \$24M. Prof. J. Luxat is the project leader.

CANS is comprised of four primary facilities, namely:

1. POST IRRADIATION EXAMINATION OF NUCLEAR MATERIALS: an irradiated materials examination facility consisting of a suite of custom designed, fabricated and installed hot cells. There are 5 separate workstations for receiving, machining, sample preparation, mechanical testing and optical microscopy examination of material samples. Each work station has its own shielded window and pair of remote manipulators. At the end of the hot cell suite is an instrument room containing a shielded dual beam Scattering Electron Microscope/Focused Ion Beam (SEM/FIB) and a Transmission Electron Microscope (TEM). Two fume hoods are located in this room for handling and etching of small active samples. This facility is located at McMaster University in a room within the McMaster Accelerator Laboratory building and will be operated by McMaster's Nuclear Operations and Facilities organization. (Construction complete and initial commissioning will start in April 2015)

An equipment sharing agreement has been established between CANS and the CANMET- Materials Technology Laboratory (MTL) in the McMaster Innovation Park.

2. NUCLEAR MATERIALS CHARACTERIZATION FACILITY: a materials characterization and analysis facility that will be used to investigate the mechanical behaviour of existing and newly developed materials (including irradiated in-reactor core components, GEN IV materials and technology). The facility includes a Three Dimensional Atom Probe (3DAP) and Scattering Electron Microscope/Focused Ion Beam (SEM/FIB) and is collocated in the Brockhouse Institute for Materials Research (BIMR) adjacent to the Canadian Centre for Electron Microscopy at McMaster University. (Facility operational)
3. THERMAL TESTING FACILITY to obtain experimental data to develop and test nuclear safety thermalhydraulic models. This facility include a heated Flow Loop, upgraded power supply with 265 kW capacity, cooling heat exchangers, a new heat transfer test section and 3-D Tomography and High Speed Video instrumentation for state-of-the-art visualization. This facility is located in the Nuclear Research Building (NRB) at McMaster University. (Facility operational)
4. HEALTH PHYSICS DOSE RESPONSE FACILITY containing a Neutron Generator and Gamma Imaging devices to conduct research in mixed radiation fields (neutron + gamma). This is located at University of Ontario Institute of Technology (UOIT). (Facility operational)



