Canadian Nuclear Laboratories | Laboratoires Nucléaires Canadiens

X-Ray Diffraction Laboratory

CNL's X-Ray Diffraction Laboratory (XRDL) is a modern, computer-controlled facility with diffractometers capable of providing texture, line- broadening, residual stress, phase transformation and powder diffraction analyses for both non-active and radioactive materials. The X-ray diffractometers are routinely used for the study of structural and fuel materials used in the nuclear industry. In addition to measurement and analysis, the XRDL has extensive specimen preparation capabilities for non-radioactive and radioactive materials.

The CNL X-Ray Diffraction Laboratory is unique in its ability to handle radioactive materials. Also unique is the texture determination technique that is applied to establish a basal pole figure by direct measurements, where the calculation of an f-factor is the desired goal. This texture determination method is exclusively applicable to hexagonal structured materials and in particular zirconium-alloys used in the nuclear industry. Apart from texture and powder diffraction work other novel techniques that are applied in the study of the microstructure of materials, including X-ray line-broadening and residual stress analysis. There are three main diffractometers currently in use in the laboratory, and all utilize a copper X-ray source.

The criteria for desirable microstructure used to qualify fuel channel components for use in CANDU reactors have been developed in the X-Ray Diffraction Laboratory. These criteria are used as industry-wide standards applied in manufacturing specifications for fuel channel components in new-build and refurbishment projects. The techniques developed in CNL's X-Ray Diffraction Laboratory have been passed on to other laboratories through commercial partnerships.

A multi-disciplinary approach to solving problems is often required in R&D and the work in the X-Ray Diffraction Laboratory is performed in conjunction with other on-site laboratories, for example the Scanning Electron Microscopy Laboratory, that have complementary capabilities.

The X-Ray Diffraction Laboratory would welcome partnerships with universities and industry.