



Recycle Fuel Fabrication Laboratories

CNL's Recycle Fuel Fabrication Laboratories (RFFL), located at its Chalk River Laboratories (CRL), has been in operation for over 30 years. The RFFL is designed to produce mixed-oxide (MOX) fuel, which consists of plutonium oxide (PuO_2) or uranium-233 oxide ($^{233}\text{UO}_2$) blended with uranium oxide (UO_2) or thorium oxide (ThO_2). The RFFL is the only facility in Canada that can handle and process plutonium and other minor actinides-containing materials. The MOX fuel manufactured in the RFFL is used to simulate various stages in the conventional natural uranium fuel cycle, simulate irradiations in power reactor conditions and/or to develop advanced fuel cycles.

The activity of a MOX fuel is determined by the activity of its minor fissile component (^{239}Pu and ^{233}U). Because of the extremely high activity of these isotopes, all fabrication operations must be carried out in glove boxes and fume hoods to prevent contamination of the workplace and the environment with air-borne alpha particles. The RFFL has 27 purpose-built glove boxes and seven fume hoods.

THE RECYCLE FUEL FABRICATION LABORATORIES GLOVE BOXES AND FUME HOODS ARE USED FOR:

1. Plutonium and uranium reception
2. MOX fuel fabrication
3. Analytical chemistry
4. Actinide chemistry
5. Metallography
6. Waste treatment

RFFL specialists have extensive knowledge in the handling and processing of plutonium and minor actinides, in the manufacturing of MOX fuel elements and bundles, as well as chemical analysis of plutonium solution, and metallographic preparation and analysis of fuel pellets. With this knowledge, they are able to leverage existing expertise to enhance any project in this field.





Many experiments and theoretical studies can be performed in the RFFL. The most common research undertaken includes:

- The determination of the sintering temperature and shrinkage of fuel pellets,
- The development of recovery processes,
- Actinide chemistry,
- Kinetic studies on the diffusion of plutonium and other minor actinides, and
- Thermodynamic studies of MOX solid solutions.

The RFFL also provides the following services:

- The handling and processing of Pu and other minor actinides-containing materials,
- The repackaging of legacy Pu-containing materials to modern standards,
- The identification and processing of historical items,
- The sampling of Pu-containing materials for the CNSC and IAEA, and
- The preparation of Pu-containing material samples for chemical analysis.

At the Recycle Fuel Fabrication Laboratories, we are interested to partner in projects such as the manufacture of MOX fuels, and research into MOX fuels and actinide chemistry.

THE RFFL HAS DEVELOPED FABRICATION PROCEDURES FOR THE FOLLOWING TYPES OF MOX FUEL:

- $(U, Pu)O_2$
- $(Th, Pu)O_2$
- $(Th, {}^{233}U)O_2$

THE RFFL CAN ALSO FABRICATE THE FOLLOWING TYPE OF FUELS:

- Inert matrix fuel, for experiments on the transmutation of plutonium and minor actinides
- Advanced nuclear fuel incorporating neutron absorbers

