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## **Unique capabilities and methods for analysing nuclear waste form materials using ANSTO's landmark infrastructure**

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In situ investigations of nuclear waste form related materials under extreme conditions are highly desirable for understanding and optimising applications of these materials, however they are often exceedingly challenging from a safety and radiological perspective. As a part of our investigations into actinide materials, we have developed a number of novel experimental methodologies which utilize ANSTO's landmark research infrastructure, the Opal nuclear reactor and Australian Synchrotron, towards examining the behaviour of actinide materials related to nuclear waste forms under extreme conditions. This presentation will highlight some of our successes in advancing the study of actinide and nuclear materials including

- High temperature in situ redox chemistry of uranium using X-ray absorption spectroscopy.
- The behaviour of uranium oxides under high pressure ( $>6$  GPa) using neutron diffraction.
- High temperature studies of thorium oxides using synchrotron X-ray and neutron diffraction.
- Chemistry of uranium oxides under high purity hydrogen gas reduction and high temperature conditions (1000 °C) using synchrotron X-ray diffraction.

### **Summary**

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