



Contribution ID : 83

Type : **Oral Presentation**

## **Partitioning of Ce, as a Simulant for Pu, in a Multiphase Ceramic Nuclear Waste Form**

*Wednesday, 1 November 2017 09:45 (15)*

A multi-phase titanate waste form was synthesized using high temperature sintering in air or Ar with the composition of  $\text{Ca}_{0.71}\text{Y}_{0.088}\text{Ce}_{0.52}\text{Hf}_{0.22}\text{Ti}_2\text{O}_x$ . The phase assemblage was investigated as a function of the sintering atmosphere. X-ray diffraction measurements indicated that oxidizing sintering atmosphere (air) favors the formation of pyrochlore, whereas neutral environment (Ar) promotes the formation of perovskite, although both sintering atmospheres produced samples containing three phases (pyrochlore, perovskite and rutile under air or zirconolite, perovskite and rutile under Ar). Scanning electron microscope (SEM) analysis revealed that Ce is present in perovskite and pyrochlore (or zirconolite), but not in rutile. Micro-X-ray-Absorption-Near-Edge-Structure (micro-XANES) measurements conducted at the Ce L-edge, in combination with electron energy loss spectroscopy (EELS), showed that  $\text{Ce}^{4+}$  prefers to inhabit the pyrochlore (or zirconolite) phase and  $\text{Ce}^{3+}$  the perovskite phase. This knowledge is valuable for the further development of titanate waste forms to immobilize Pu.

### **Summary**

**Primary author(s) :** Dr ZHANG, Zhaoming (ANSTO)

**Co-author(s) :** Dr VANCE, Eric R. (ANSTO); Dr LUMPKIN, Gregory (ANSTO); Mr DAVIS, Joel (ANSTO); Dr SPIERS, Kathryn (Australian Synchrotron)

**Presenter(s) :** Dr ZHANG, Zhaoming (ANSTO)

**Session Classification :** Ceramic and Glass-Ceramic Wasteforms

**Track Classification :** National and international collaborative waste management programs