

Low-Risk Nuclear Waste Forms for INEEL SBW & HLW Calcines

Executive Summary

CLASS: Nuclear waste immobilization technologies.

STATUS: Industrial scale demonstration.

MARKETS: Treatment of problematic, heterogeneous, radioactive wastes.

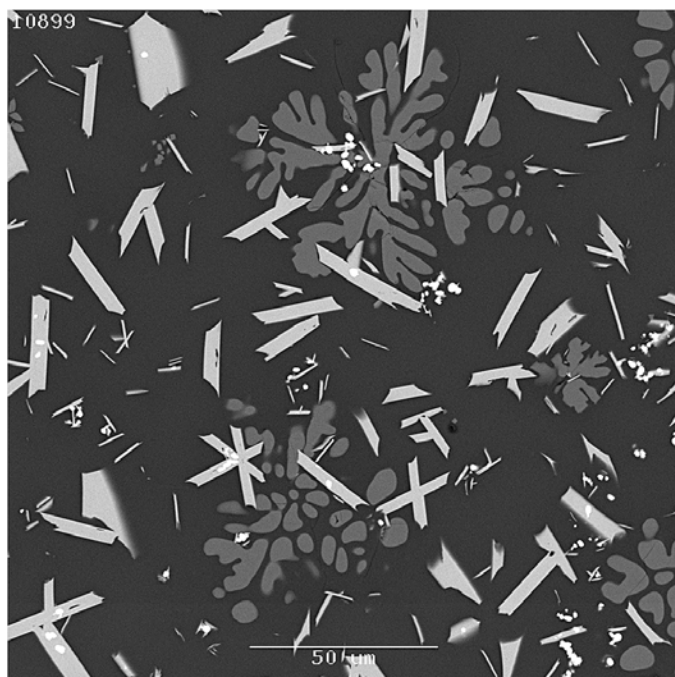
INTELLECTUAL PROPERTY: Know-how, pilot facilities, chemistry and process.

COMMERCIALIZATION: Strategic market alliances for defined end user applications including INEEL SBW and HLW calcines.

Technology Background

ANSTO, has over 25 years experience in designing low-risk, reduced-cost, tailored ceramic and glass-ceramic waste forms for the immobilization of radioactive waste.

High waste loading glass-ceramic composites that combine the process and chemical flexibility of glass waste forms with the superior chemical durability of ceramics have been developed for INEEL wastes, capable of treating the entire range of SBW and HLW calcine compositions on a single processing platform.



Tailored glass-ceramic matrices offer a superior immobilization option for wastes that to date have been considered highly problematic because of their complex and heterogeneous chemistry.

In addition to INEEL, other potential waste applications in the DOE complex, and globally, are anticipated.

synrocANSTO has developed a range of tailored waste forms which apply to wastes difficult to incorporate in glass.

synrocANSTO Advantages

Intrinsic technology advantages include:

- Multi-billion dollar life cycle cost savings projected over current mainstream vitrification processes;
- *Multi-year reduction in cleanup schedules over current mainstream vitrification processes;*
- Single process platform to immobilize SBW and HLW calcines;
- *Retrofit of current process hardware;*
- Waste loadings of 50-80+% (two to three times borosilicate glass loadings for HLW calcines);
- *Volume reduction of 25 - 35% compared to untreated calcine*
- Aqueous durability significantly better than EA glass;
- *Immobilization of long-lived radionuclides in durable ceramics;*
- Waste form chemistry with potential auto-catalytic NOx reduction benefits in calcining the remaining liquid SBW.

Market applications

DEMONSTRATED: Non-active 40 kg application using hot isostatic pressing (HIP) & 80 kg using cold-crucible induction melting (CCIM);

DEMONSTRATED: Active trials with plutonium using hot isostatic pressing (HIP);

DEMONSTRATED: Immobilization of wastes containing problematic chemical components for conventional borosilicate glass.

ANSTO can optimize the waste form chemistry for target wastes and process technology to achieve best performance at lowest risk and minimum cost.

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