Synroc
The importance of the waste form

- Reduces life cycle costs
- Minimise disposal volume
- Optimising durability
- Low environmental risk
Storage volume of waste comparison

Cementation final storage volume
100 m³

Alkaline liquid waste per year
4 m³

Proposed storage volume
12 m³*

Synroc
2.4 m³

* Over package volume assumed - 5x
Incorporation Mechanism
ANSTO Nuclear Medicine Project

TWO PARTS

Mo-99 Facility
ANM

Synroc Waste Plant
SyMo
Waste Form Assessment

- Evaluated treatment technologies for wastes from Mo-99 production

- Legacy and future Mo-99 waste from ANM production

- Alkaline process:
  - ILLW
  - U filter cake
Waste Form Options

Ceramic
- Lattice substitution
- HLW / ILW
- $10^{-5}$ g/m$^2$/d

Glass
- Glass network incorporation
- HLW / ILW
- $10^{-3}$ g/m$^2$/d

Glass-ceramic
- Composite glass-ceramic
- HLW / ILW
- $10^{-3}$ - $10^{-5}$ g/m$^2$/d

Cement
- LLW
- Continuous porosity
- Diffusion release
- Waste ions located in pore water
Benefits arising from the HIP treatment route:
- Maximum waste volume reduction
- Immobilises volatile components
- Versatile - multi-mission and can treat different waste streams.

*Hot Isostatic Press (HIP)*
Assessment Criteria

• No existing Waste Acceptance Criteria

• Conservative approach adopted HLW criteria for ILW

• Waste form acceptability defined with reference to international durability tests (PCT-B)

• LLW criteria not suitable for ILW
Synroc plant

Treatment of Intermediate-Level Liquid Waste (ILLW) from alkaline dissolution process

**4500 L** per year to be treated after 2 years decay storage
- ~6M NaOH + NaAlO₂ + Fission Products

**B54 Legacy ILLW (~10,000 L)** to be treated

**Future phase** – Immobilisation of Uranium residue waste
Synroc Mo-99 HIPed Cans

- Verified HIP process at full scale (~30L)
- Exceeds chemical durability criteria by a factor of x10
- Performance independent of scale
Synroc benefits for Mo-99 waste management

• Excellent chemical durability
  – meet future waste acceptance criteria
  – lower environmental risk

• Minimise disposal volumes
  – deliver lifecycle cost savings

• Multi-mission process capability
  – to treat additional waste streams
Synroc waste treatment plant