Technology Information	
Area	2
Title	Conditioning of residues from water treatment
Submitted by	NUKEM Technologies GmbH, in cooperation with ALD/FNAG

1. Overview of Technologies (features, specification, functions, owners, etc.)

The purification of contaminated water produces considerable volumes of high-active spent, loaded inorganic absorbers (zeolite like, silicagel, etc.), which for intermediate and final storage will be required to be conditioned.

A newly developed matrix, the IGM, offers unique advantages.

Waste, graphite and borosilicate glass are mixed together, introduced into a container, and subsequently subjected to vacuum, pressure (1.000 bar), and high temperature (1.000 °C). The industrially well-established Hot Isostatic Pressure HIP process may be applied.

The advantages of this system are:

- **No radiolysis:** Water content in product can be reduced as far as wanted by application of vacuum and heating for drying/gas removal,
- **No Cs losses:** (ie Zero!), since closed system during HIP,
- **Volume reduction:** by factor 2 (bulk Zeolite/IGM product 60 w% loaded),
- **High leaching stability:** due to low porosity and corrosion resistance of glass/ graphite combination,
- **Heat dissipation:** better than vitrified product, since graphite has higher heat conductivity compared to glass (and much better than hot-pressed pure Zeolite).

2. Notes (Please provide following information if possible.)

Technology readiness level (including cases of application, not limited to nuclear industry, time line for application):

- Lab-scale test have been done, followed by investigations of properties.
- The HIP process is well known and proven in conventional industry for the manufacturing of high dense ceramic compounds.
- HIP has been tested as compaction method for different radioactive wastes in different matrices e.g. the consolidation of Plutonium in UK by NNL.
- The IGM matrix is a new development for radioactive waste embedding. The manufacturing of IGM by HIP has already been proven with inactive waste simulants.

Challenges

The process may have to be adapted for high radiation environments.

Others (referential information on patent if any)

Patents: JP 4944276 B2 2012.5.30, JP 5237475 B2 2013.7.17