# Technology Information

<table>
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<th>Area</th>
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<tbody>
<tr>
<td>Title</td>
<td>Conditioning of residues from water treatment</td>
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<tr>
<td>Submitted by</td>
<td>NUKEM Technologies GmbH, in cooperation with ALD/FNAG</td>
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## 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, timeline 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)