## Radioactive Waste Treatment and Decommissioning Product Recommendations

Ion exchange resins are an efficient and simple way to purify waste streams and concentrate radioisotopes on a solid substrate before treated liquid is released to the environment or recycled to the nuclear circuits. In certain cases reverse osmosis membranes can be used to upconcentrate the radioactive stream and thus reduce the amount of liquid waste requiring treatment. During decommissioning operations, which mainly occur under water, ion exchange resins are used to purify decommissioning units to increase visibility and remove contaminants, as well as treat effluent when the decommissioning pool is emptied.

### Ion Exchange Resins

<table>
<thead>
<tr>
<th>TECHNOLOGY</th>
<th>PRODUCT</th>
<th>APPLICATION</th>
<th>FEATURES AND RECOMMENDED USES</th>
<th>TYPE</th>
<th>MATRIX</th>
<th>MINIMUM TOTAL VOLUME CAPACITY (eq/L)</th>
<th>IONIC FORM AS SHIPPED</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMBERLITE™ IRN99 H</td>
<td>Rad Waste Treatment</td>
<td>Premium 16% DVB uniform particle size cation resin with very high capacity and oxidative stability. Highest selectivity for cationic radioisotopes and highest total capacity for long runs resulting in reduced waste and exposure.</td>
<td>SAC</td>
<td>GEL</td>
<td>2.50</td>
<td>H⁺</td>
<td></td>
</tr>
<tr>
<td>AMBERLITE™ IRN78 OH</td>
<td>Rad Waste Treatment</td>
<td>Premium high solid uniform particle size anion resin with very high capacity used for removal of anionic radioisotopes.</td>
<td>SBA</td>
<td>GEL</td>
<td>1.20</td>
<td>OH⁻</td>
<td></td>
</tr>
<tr>
<td>AMBERLITE™ IRN9766 OH</td>
<td>Rad Waste Treatment</td>
<td>Macroporous anion resin designed to remove radioactive colloidal material in all nuclear applications. Often used as an overlay above a mixed bed or a cation resin.</td>
<td>SBA</td>
<td>MACRO</td>
<td>0.85</td>
<td>OH⁻</td>
<td></td>
</tr>
<tr>
<td>AMBERLITE™ IRN9652 H</td>
<td>Rad Waste Treatment</td>
<td>Macroporous high capacity cation resin with high affinity for heavy metals &amp; 137Cs.</td>
<td>SAC</td>
<td>MACRO</td>
<td>1.95</td>
<td>H⁺</td>
<td></td>
</tr>
<tr>
<td>AMBERLITE™ IRN9675 H</td>
<td>Rad Waste Treatment</td>
<td>Nuclear grade macroporous cation resin designed to remove radioactive colloidal material in all nuclear applications. Often used as an overlay above a mixed bed.</td>
<td>SAC</td>
<td>MACRO</td>
<td>1.70</td>
<td>H⁺</td>
<td></td>
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<tr>
<td>AMBERLITE™ IRN160 H/OH</td>
<td>Rad Waste &amp; Decommissioning</td>
<td>High capacity nuclear grade mixed bed composed of uniform particle size AMBERLITE™ IRN97 H and IRN78 OH Resins on a 1:1 equivalent basis. Designed to minimize separation of anion and cation during installation and transfer.</td>
<td>MB</td>
<td>GEL/GEL</td>
<td>2.10/1.20</td>
<td>H⁺/OH⁻</td>
<td></td>
</tr>
<tr>
<td>AMBERLITE™ IRN170 H/OH</td>
<td>Rad Waste &amp; Decommissioning</td>
<td>Premium nuclear grade mixed bed composed of uniform particle size AMBERLITE™ IRN99 H and IRN78 OH Resins on a 1:1 equivalent basis. Highest Selectivity for radioisotopes and highest total capacity for long resin life resulting in reduced waste and exposure.</td>
<td>MB</td>
<td>GEL/GEL</td>
<td>2.50/1.20</td>
<td>H⁺/OH⁻</td>
<td></td>
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<tr>
<td>AMBERLITE™ IRN9882 H/OH</td>
<td>Rad Waste &amp; Decommissioning</td>
<td>Nuclear grade macroporous mixed bed composed of 40% cation resin (12%DVB) and 60% AMBERLITE™ IRN9766 Resin on a volume basis. Offers high exchange kinetics and the ability to remove colloids for highest decontamination rates.</td>
<td>MB</td>
<td>MACRO/MACRO</td>
<td>1.65/0.85</td>
<td>H⁺/OH⁻</td>
<td></td>
</tr>
</tbody>
</table>

### Reverse Osmosis

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<tr>
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<th>IONIC FORM AS SHIPPED</th>
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<tr>
<td>DOW FILMTEC™ Elements</td>
<td>Rad Waste &amp; Decommissioning</td>
<td>Please contact your Dow representative for assistance.</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

Key:
- SBA = Strong Base Anion
- SAC = Strong Acid Cation
- MB = Mixed Bed
- Chel. = Chelating resin
Powering performance worldwide.

With a large global manufacturing footprint, strong R&D expertise and technical support services and systems, we supply high market volumes with high quality. Dow partners with you, our customer, to understand unmet needs and develop tailored solutions.

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- Collegeville, PA*
- Edina, MN*
- Huzhou, China
- Kaust Jeddah, KSA
- Midland, MI*
- Shanghai, China*
- Tarragona, Spain**

*DW&PS Technology Center
**Global Water Technology Center

### MANUFACTURING
- Chauny, France
- Edina, MN
- Fombio, Italy
- Huzhou, China
- Jubail Industry City, Saudi Arabia
- Menlo Park, CA
- Midland, MI
- Qingpu, China
- Soma, Japan

### COMMERCIAL OPERATIONS
- Astana, Kazakhstan
- Bangkok, Thailand
- Budapest, Hungary
- Dubai, UAE
- Horgen, Switzerland
- Johannesburg, South Africa
- Kuala Lumpur, Malaysia
- Moscow, Russia
- Mumbai, India
- Nairobi, Kenya
- Rheinmünster, Germany
- São Paulo, Brazil
- Seoul, Korea
- Sydney, Australia
- Tokyo, Japan
- Warsaw, Poland

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**Water & Process Solutions**

<table>
<thead>
<tr>
<th>7600 Metro Blvd.</th>
<th>Edina, MN 55439</th>
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For more information, contact our Customer Information Group: dowwaterandprocess.com

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<td>Latin America</td>
<td>+55 11 5184 8722</td>
</tr>
<tr>
<td>North America</td>
<td>1-800-447-4369</td>
</tr>
</tbody>
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WARNING: Oxidizing agents such as nitric acid attack organic ion exchange resins under certain conditions. This could lead to anything from slight resin degradation to a violent exothermic reaction (explosion). Before using strong oxidizing agents, consult sources knowledgeable in handling such materials.

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