Water-Swelling Polymer Networks
From Hydrogels to Superabsorbers

Hydrogels are characterized by the pronounced affinity of their chemical structures for aqueous solutions in which they swell rather than dissolve. Such polymeric networks may range from being mildly absorbing, typically retaining 30 wt. % of water within their structure, to superabsorbing, where they retain many times their weight of aqueous fluids. Several synthetic strategies have been proposed to prepare absorbent polymers: (i) polyelectrolyte(s) subjected to covalent cross-linking, (ii) associative polymers consisting of hydrophilic and hydrophobic components (“effective” cross-links through hydrogen bonding), and (iii) physically interpenetrating polymer networks yielding absorbent polymers of high mechanical strength. Clearly, these strategies are not mutually exclusive, and efforts have focused on tailoring composite gels which are critically reliant on the balance between polymer–polymer and polymer–solvent interactions under various stimuli including changes in temperature, pH, ionic strength, solvent, concentration, pressure, stress, light intensity, and electric or magnetic fields.

A sampling of absorbent polymers of synthetic (petrochemical) origin, available from Aldrich, is provided below along with morphology and absorption characteristics. We also offer an extensive selection of polymers of natural (starches, etc.) and semisynthetic (cellulose ethers, etc.) origins for use in the synthesis of multicomponent hydrogels.

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**Polymer Products From Aldrich—The Link to All Your Polymer Needs!**

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**Absorbent Polymer Catalog**

<table>
<thead>
<tr>
<th>Catalog No.</th>
<th>Absorbent Polymer</th>
<th>Morphology</th>
<th>Absorption Characteristics</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>43,532-5</td>
<td>Poly(acrylic acid), potassium salt, lightly cross-linked</td>
<td>Powder; particle size 99% &lt; 1,000μm</td>
<td>Absorbs ca. 27g/g of 1% saline solution; rate of absorption more rapid than for corresponding Na salt</td>
<td>250g; 1kg</td>
</tr>
<tr>
<td>43,636-4</td>
<td>Poly(acrylic acid), sodium salt, lightly cross-linked</td>
<td>Powder; particle size 99% &lt; 1,000μm</td>
<td>Absorbs ca. 45g/g of 1% saline solution</td>
<td>250g; 1kg</td>
</tr>
<tr>
<td>43,277-6</td>
<td>Poly(acrylic acid-co-acrylamide), potassium salt, cross-linked</td>
<td>Granules; 200-1,000μm; pH 5.5-6.0</td>
<td>Absorbs many times its weight of aqueous fluids</td>
<td>250g; 1kg</td>
</tr>
<tr>
<td>43,278-4</td>
<td>Poly(acrylic acid), sodium salt-graft-poly(ethylene oxide), cross-linked</td>
<td>Granular powder; 100-850μm</td>
<td>Absorbs many times its weight of aqueous fluids</td>
<td>250g; 1kg</td>
</tr>
<tr>
<td>19,206-6</td>
<td>Poly(2-hydroxyethyl methacrylate), average M ca. 300,000</td>
<td>Crystals</td>
<td>—</td>
<td>1g; 10g; 25g</td>
</tr>
<tr>
<td>18,213-3</td>
<td>Poly(2-hydroxypropyl methacrylate)</td>
<td>Crystals</td>
<td>—</td>
<td>10g; 25g</td>
</tr>
<tr>
<td>42,427-7</td>
<td>Poly(isobutylene-co-maleic acid), sodium salt, cross-linked</td>
<td>Fiber; 24-40μm diameter</td>
<td>Absorption of 0.9 wt. % saline solution is ca. 65g/g; Absorption of distilled water is ca. 300g</td>
<td>250g; 1kg</td>
</tr>
</tbody>
</table>

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To aid in designing your application-specific hydrogel, Aldrich offers over 1,500 monomers and a wide selection of cross-linking agents. We invite you to use the chemical structure search capability on our Web site, www.sigma-aldrich.com, to locate those best suited to your needs.

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**References:**