Intelligent Self-Actuating Composite Structures

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www.bris.ac.uk/composites
Intelligent Chemo-Mechanical Systems

Hydrogels are polymers with high (>50%) equilibrium water content, which swell or shrink by absorbing or expelling water.

<table>
<thead>
<tr>
<th>Positives</th>
<th>Negatives</th>
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</thead>
<tbody>
<tr>
<td>• Soft (E &lt; 1 MPa)</td>
<td>• 3D Swelling</td>
</tr>
<tr>
<td>• High Free Strain (&gt;100%)</td>
<td>• Fragile</td>
</tr>
<tr>
<td>• Moderate Blocking Stress (1-3 MPa)</td>
<td>• Limited Actuation Data</td>
</tr>
<tr>
<td>• Direct Conversion of Chemical Energy into</td>
<td>• Slow Dimension Dependent Swelling</td>
</tr>
<tr>
<td>Mechanical Work</td>
<td>• Difficult to Control</td>
</tr>
</tbody>
</table>
pH Responsive Hydrogel: Work

Dicker M P M, Weaver P M, Rossiter J M and Bond I P 2014 Hydrogel core flexible matrix composite (H-FMC) actuators: theory and preliminary modelling Smart Materials and Structures 23 095021
pH Responsive Hydrogels: Work

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pH Responsive Hydrogels: Toughness


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pH Responsive Hydrogels: Characterisation

pH Responsive Hydrogels: Modelling

pH Responsive Hydrogels: Power

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The Faul Research Group
faulresearchgroup.com

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