Silicon offers a theoretical **10x Improvement** in charge capacity over traditional lithium ion battery materials.

<table>
<thead>
<tr>
<th>Anode Material</th>
<th>Theoretical Charge Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graphite</td>
<td>350 mAhg⁻¹</td>
</tr>
<tr>
<td>Silicon</td>
<td>3500 mAhg⁻¹</td>
</tr>
</tbody>
</table>

Can we use computer simulations to predict the Behavior of a silicon anode undergoing the lithiation process?

**Issues Associated With Silicon**

- **280% Expansion at Full Lithiation**
- **Cracking after Multiple Lithiation/Delithiation Cycles**

**Electrostatics**

**Chemical Diffusion**

**Mechanical Deformation**

The material point method and the finite volume method are used to model the three different physical processes of electrostatics, chemical diffusion, and mechanical deformation.

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