SILICIUM CONTAINING POLYMER ELECTROLYTES FOR LITHIUM BATTERIES

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Potential danger of lithium—polymer batteries should be suppressed by the choice of less flammable material. We have tested the replacement of ethoxyethylmethacrylate (EOEMA) by silicium containing trimethoxysilyl propylmethacrylate [1] (TMSPMA) for the preparation of safer gel composite electrolytes.

The composite electrolytes were prepared from a solution of lithium salt in propylene carbonate, monomer, dimethacrylate as cross-linking substances and polymerization agent BEE. Polymerization was performed in a transparent mould by UV radiation. “Physical gels” or composites [2] were produced. Conductivity and elasticity of products were observed. LiClO₄ and LiBF₄ as conducting salts were used.

OTA of samples prepared from EOEMA and TMSPMA was compared. Apparently, a non-combustible residuum 10 – 15% of the material remains. The lower flammability is thus confirmed. The conductivity of selected gels is given in Table. According it, the conductivity of TMSPMA gel is comparable and in some cases even higher than that of gels containing EOEMA. Also the influence of cross-linking od dimethacrylate type is not too markedly pronounced. Best results were obtained using triethylene glycol dimethacrylate, which increases the conductivity by factor 2 – 3.

These results support the model of “physical” or composite gel in which liquid solution is kept inside voids in a polymeric network. TMSPMA gels are in general less coherent or rigid than just EOEMA or PMMA gels.

<table>
<thead>
<tr>
<th>Conductivity of gels</th>
<th>TMSPMA</th>
<th>EOEMA</th>
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<tbody>
<tr>
<td>LiBF₄</td>
<td>5.39E-06</td>
<td>9.36E-06</td>
</tr>
<tr>
<td>LiClO₄</td>
<td>2.57E-04</td>
<td>1.62E-05</td>
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References