FOAMING SYSTEMS (PROJECT A10)

Introduction and Motivation

Polymeric foams offer a wide range of beneficial properties as a thermal and acoustic insulator, improved energy absorption, outstanding effect or less materials usage. As a result of these beneficial properties, polymeric foams are widely used in industrial applications. To satisfy steadily increasing demands on the property profile of polymeric foams, novel and innovative approaches have to be developed. Combining blending and foaming can be identified as a promising approach. In addition to the property profile of the compact material, blending of polymers can adjust the important properties for foaming as the rheological properties, diffusion, solubility or cell nucleation. However, combining blending and foaming does not only offer new chances but also poses challenges. Regarding immiscible blends, the difference in processing window as well as the influence of viscosity and glass transition temperature can inhibit foam expansion. This could be observed foaming PPE/SAN blends using CO₂ as blowing agent. A novel approach is to choose a blowing agent, which shows an improved plasticizing effect on the high viscous blend phase.

Materials

- **Polymers:** PPE, SAN, SBM
- **Blowing agents:** ethanol, n-pentane

<table>
<thead>
<tr>
<th>System</th>
<th>ρ (kg/m³)</th>
<th>Foaming density (ρ)</th>
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<tbody>
<tr>
<td>PPE/SAN 0/100</td>
<td>207±19</td>
<td>1.47</td>
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<tr>
<td>PPE/SAN 20/80 + 10 wt% SBM</td>
<td>231±14</td>
<td>3.26</td>
</tr>
<tr>
<td>PPE/SAN 60/40 + SBM</td>
<td>327±15</td>
<td>5.09</td>
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Compatibilized systems:
- **Compatibilizer:** SBM (Compatibilizer) Poly(oxy-1,4-butadiene)-b-poly(2,6-dimethyl-1,4-phenylene ether) (BASF SE, Luran VLL 19)

Blowing agent absorption is responsible for foaming behavior. Poor solubility of blowing agent in one blend phase:
- No significant influence of small amounts of SBM
- Elevated SBM content leads to cell collapse as result of decreasing viscosity
- Decreasing viscosity by increasing compatibilization leads to collapse

Conclusions

- Blow molding process can be adjusted but blend properties affect cell stabilization
- No significant influence of compatibilization on diffusivity and solubility

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Publications of Project A10


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