Supporting Information

Enhanced Properties of Polyurea Elastomeric Nanocomposites with Anisotropic Functionalized Nanofillers

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Fig. SI-1: Chemical structures for the diamino-terminated poly(propylene oxide), Jeffamine D-2000, \(M_n = 2000 \text{ g mol}^{-1}\), \(x \approx 33\) (Huntsman Corporation), and the triisocyanate crosslinker, Basonat HI-100 (BASF SE), \(m_w = 505 \text{ g mol}^{-1}\).
Fig. SI-2: DSC thermograms for the reference elastomer E0 and the three IOENs E1, E2 and E3 at the scanning rate of 10° K min⁻¹. The three arrows indicate the temperatures related to the glassy state, and the two rubbery states (physical and chemical network, and chemical network) where DMA analysis was performed.
Fig. SI-3: DMA frequency-sweep experiments from $f = 10^{-2}$ to $2 \cdot 10^{2}$ Hz for the reference elastomer E0 and the three IOENs E1, E2 and E3 at different temperatures: -70, -65, -60, -50, -40, -10, +20, +40 and +80 °C.
Fig. SI-4: Shifting of the DMA frequency-sweep experiments at different temperatures for the reference elastomer E0 and the three IOENs E1, E2 and E3.
Fig. SI-5: DMA frequency-sweep master curves for the reference elastomer E0 and the three IOENs E1, E2 and E3.
Fig. SI-6: a) Temperature dependence of the shift factor $a_T$ for the reference elastomer E0 and the three IOENs E1, E2 and E3. The solid lines represent the fits according to the WLF equation - (see eq. 8) with a reference temperature of $T_{\text{ref}} = 293.16$ K. b) Material constants $C_1$ and $C_2$ as function of the nanoparticle concentration.

Table SI-1: Material constants $C_1$ and $C_2$ for the reference elastomer E0 and the three IOENs E1, E2 and E3 obtained from the WLF fitting with a reference temperature of $T_{\text{ref}} = 293.16$ K.

<table>
<thead>
<tr>
<th>sample</th>
<th>$c$ (wt%)</th>
<th>$C_1$</th>
<th>$C_2$ (K)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E0</td>
<td>0</td>
<td>4.74</td>
<td>125</td>
</tr>
<tr>
<td>E1</td>
<td>0.3</td>
<td>5.39</td>
<td>131</td>
</tr>
<tr>
<td>E2</td>
<td>0.6</td>
<td>6.16</td>
<td>137</td>
</tr>
<tr>
<td>E3</td>
<td>1.2</td>
<td>6.66</td>
<td>141</td>
</tr>
</tbody>
</table>
Fig. SI-7: a) Uniaxial stress-strain deformation curves for the reference elastomer E0 and the three IOENs E1, E2 and E3 at 20 °C. b) Zoom-in at the initial strain values.