Supporting Information

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Supporting Information for Advanced Materials

A Simple and Efficient Route to Transparent Nanocomposites

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Supporting figures

Dynamic light scattering and SEM images

Size distribution, obtained by dynamic light scattering, of the hydrophobized particles after phase separation (black curve) and after redispersion in $n$-heptane (red curve) using copolymer 1 and SiO$_2$ particles. The SEM image shows the particles after redispersion.

Size distribution, obtained by dynamic light scattering, of the hydrophobized particles after phase separation (black curve) and after redispersion in $n$-heptane (red curve) using copolymer 2 and SiO$_2$ particles. The SEM image shows the particles after redispersion.
Size distribution, obtained by dynamic light scattering, of the hydrophobized particles after phase separation (black curve) and after redispersion in \( n \)-heptane (red curve) using copolymer 3 and SiO\(_2\) particles. The SEM image shows the particles after redispersion.

**UV-VIS spectroscopy of the polyurethane/SiO\(_2\) nanocomposite films**

UV/VIS spectra of the polyurethane/SiO\(_2\) nanocomposite materials. Full transparency is observed using copolymer 1 to hydrophobize the SiO\(_2\) nanoparticles (black curve) compared to a polyurethane film containing no SiO\(_2\) particles (blue curve). Transparency of the polyurethane/SiO\(_2\) nanocomposite films is lost if copolymer 2 (red curve) or copolymer 3 (green curve) are used as emulsifiers for SiO\(_2\).

**Functionalization of Al\(_2\)O\(_3\) and CeO\(_2\) nanoparticles**

Al\(_2\)O\(_3\) and CeO\(_2\) nanoparticles were functionalized using an amphiphilic copolymer 4, consisting of EHMA and 4-Vinylpyridin, which was further reacted with 1,3-propanesulton (see scheme below).
Scheme: Synthesis of amphiphilic copolymer 4 used to functionalize $\text{Al}_2\text{O}_3$ and $\text{CeO}_2$ nanoparticles. The amount of EHMA in this copolymer is 85 mol.-% ($M_n=9000 \text{ g/mol}, \text{PDI} = 1.8$).

The surface modified inorganic particles were prepared by dissolving the copolymer in n-hexane (6 mL). Separately the aqueous silica dispersion was diluted with of ethanol (2 mL). The concentration of the copolymer in n-hexane was 17 g L$^{-1}$ and the concentration of the $\text{SiO}_2$ dispersion in ethanol was 40 g L$^{-1}$. The two mixtures were combined to give a monophasic system. Phase separation was induced by the addition of water (0.2 mL). After complete phase separation, the nonpolar phase exclusively contained the hydrophobized silica nanoparticles.

The size of the functionalized $\text{Al}_2\text{O}_3$ particles is approx. 70 nm (initial size before functionalization is approx. 50 nm), measured by dynamic light scattering after redispersion in n-heptane. The size of the functionalized $\text{CeO}_2$ particles is approx. 29 nm (initial size before functionalization is approx. 10 nm), measured by dynamic light scattering after redispersion in n-heptane.

Size distribution, obtained by dynamic light scattering, of the hydrophobized particles after phase separation (black curve) and after redispersion in $n$-heptane (red curve) using copolymer 4 and $\text{CeO}_2$ particles. The SEM image shows the particles after redispersion.
Size distribution, obtained by dynamic light scattering, of the hydrophobized particles after phase separation (black curve) and after redispersion in \( n \)-heptane (red curve) using copolymer 4 and \( \text{Al}_2\text{O}_3 \) particles. The SEM image shows the particles after redispersion.