

Thermal properties of the POSS-containing nanocomposites based on PU/PHPMA semi-IPNs

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Germany)

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To investigate the impact of POSS content (1-10 wt. %) on the thermal properties of the nanocomposites based on PU/PHPMA semi-IPNs

Methods

- Thermogravimetric analyzer Q50 (TA Instruments, USA) - Dynamic scanning calorimeter Q2000 (TA Instruments, USA) - Multifunctional FT-IR spectrometer TENSOR37 (Bruker,

-sIPN15

-sIPN15-1

sIPN15-3

-sIPN15-5

-sIPN15-10

--- PU





Results & Discussion: DSC/TGA

From the DSC data (first scans) (Fig.1) transition the glass temperature (T_q) of the nanocomposites was found to be increased with increasing of POSS content. The TGA curves for all the samples (Fig.2a) displayed similar degradation



For sIPN15 nanocomposites $T_{d(max)}$ shifted to higher values, comparing with PU network.

The main region where the POSS content influences the nanocomposite's structure was clearly observed in the area 1040–1150 cm⁻¹. In Fig. 3 (curves 3-5) the asymmetric stretching band of C-O-C groups are shifts significantly towards lower wavenumbers from 1096 cm⁻¹ for neat sIPN15 to 1084 cm⁻¹ in sIPN15-5 that may be due to a increase of the participation of C–O–C groups in the formation of hydrogen bonds. In the range of 1728–1707 cm⁻¹ the neat sIPN15 has a wide peak centered near 1728 cm⁻¹, which characterizes the hydrogen bonds in disordered domains. In the sIPN15-10 is clearly visible the decrease and redistribution of the intensities of this peak in favor of the growth of the peak shoulder at 1707 cm⁻¹ corresponding to the ordered hydrogen-bonded carbonyl groups.

Conclusions

From DSC/TGA investigation:

- From the DSC data the glass transition temperature (Tg) of the nanocomposite was found to be increased with increasing of POSS content due to more ordered structure of the nanocomposites.

- The results of thermal properties investigation of nanocomposite demonstrate that the obtained nanocomposites are significantly more thermally stable than the native PU network and native semi-IPN-15.

• By FTIR-ATR:

- The addition of POSS nanoparticles influences the formation of hydrogen bonds in the structure of the sIPN15-nanocomposites and the structure became more ordered with increasing of POSS content.

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