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ABSTRACTS

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CHARACTERIZATION OF POLYURETHANE CROSSLINKED STRUCTURES BASED ON HYPERBRANCHED POLYESTER

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The novel polyurethane crosslinked structures based on α,ω-dihydroxy-(ethylene oxide-poly(dimethylsiloxane)-ethylene oxide) (EO-PDMS-EO), 4,4'-methylenediphenyl diisocyanate and Boltorn® hyperbranched polyester of the second pseudo generation were characterized by infrared spectroscopy, scanning electron microscopy and thermogravimetric analysis. The chemical structure and hydrogen-bond interactions of these polymers were investigated by infrared spectroscopy. The carbonyl region was fitted by the Gaussian deconvolution technique, using the PeakFit program, resulting in the determination of locations and areas of each band. The polyurethanes exhibited five absorbance peaks in carbonyl region: hydrogen-bonded carbonyl groups in ordered hard domains at 1690 cm^{-1}, free (non-bonded) carbonyl groups at 1735 cm^{-1}, hydrogen-bonded carbonyl groups in disordered domains at 1715 cm^{-1}, free carbonyl groups from ester bonds at 1725 cm^{-1} and hydrogen-bonded carbonyl groups from ester bonds at 1650 cm^{-1}. The deconvolution procedure showed very good agreement between observed and generated values. The fit standard error was in the range from 0.00013 to 0.0028 and $r^2 > 0.994$. The hydrogen bonds formation between urethane groups and between urethane –NH and ester carbonyl groups in polyurethanes increases with the decrease of EO-PDMS-EO content. The EDX analyses, performed to indentify the nature of the atoms present in the samples at a depth of 100-1000 nm from the surfaces, revealed the presence of all expected elements (C, O, Si and N). The Si percentage detected by EDX on the surface of polyurethanes increases with increasing PDMS content. The surface morphology of the polyurethanes indicated that the separation of the micro-domains was improved by increasing EO-PDMS-EO content. Thermal stability of polyurethanes increased with increase of EO-PDMS-EO content up to the temperature corresponding to the approximately 50 % of weight loss. However, at higher temperatures thermal degradation became slower for samples with lower EO-PDMS-EO content.