

## POLY(URETHANE UREA) ELASTOMERS BASED ON POLYTETRAHYDROFURAN SOFT BLOCKS AND $\text{CoFe}_2\text{O}_4$ NANOCRYSTALLINE CROSS-LINKERS

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The development of magnetoactive thermoplastic elastomers based on segmented polyurethanes and ferrite nanoparticles is an urgent task of modern materials science from both a fundamental and practical point of view.

In the present study, segmented poly(urethane urea)s including soft aliphatic blocks based on polytetrahydrofuran with a molecular weight of 2000 and hard aromatic ones of different lengths were synthesized. The length of the hard segments was determined by the combination of symmetric and asymmetric diisocyanates (4,4'-methylenediphenyl diisocyanate; 2,4-toluene diisocyanate) with single-core and quad-core diamines (m-phenylenediamine; 4,4'-bis-(4-aminophenoxy) diphenylsulfone), which were introduced as a chain extender in the second stage of the step-growth polymerization process. The structure of the synthesized multiblock copolymers was confirmed by IR and NMR spectroscopy. According to DSC, the melting of hard phase domains occurs at 20°C. It was found that all synthesized poly(urethane urea)s belong to thermoplastic elastomers as a result of DMA testing of sample films. They have a plateau of rubber-like elasticity, where the storage modulus is practically independent of temperature. In addition, the glass transition temperature of the aliphatic phase ranges from -72 to -65°C, depending on the ratio of the hard and soft block lengths.

Cobalt ferrite nanoparticles previously functionalized with amino groups were used to cross-link the polymer chains. The particles were synthesized by co-precipitating cobalt and iron hydroxides from solutions of their inorganic salts (chlorides or nitrates) with ammonia, followed by dehydration of the precipitated compositions under hydrothermal conditions. As a result, spherical nanoparticles with a size of  $12 \pm 3$  nm and superparamagnetic properties were obtained.

The introduction of a magnetic inorganic crosslinker into the poly(urethane urea) matrices was carried out in-situ during the step-growth polymerization process through the dispersion of  $\text{CoFe}_2\text{O}_4$  nanoparticles in dimethylformamide along with diamine. In some cases, the reaction at the stage of the formation of urea groups was carried out in a magnetic field to obtain composites with magnetically oriented inclusions.