THERMAL PROPERTIES OF ORGANIC-INORGANIC IPNs BASED ON CROSSLINKED POLYURETHANE, POLYHYDROXYETHYLMETHACRYLATE AND POLY(TITANIUM OXIDE)

Tsebrienko T.V.

Institute of Macromolecular Chemistry, National Academy of Sciences of Ukraine, Kiev, Ukraine
mara8@ukr.net

Organic-inorganic polymers today are some of the most promising materials that combine the properties of both organic and inorganic components, which leads to a significant improvement in their complex properties. Sol-gel technology has undergone an intensive development as the most promising method of obtaining organic-inorganic materials with an inorganic nanoparticle phase at the molecular level.

Hybrid organic-inorganic interpenetrating polymer networks IPNs (OI IPNs) were prepared using the crosslinked polyurethane (PU) based on 2,4-2,6-toluene diisocyanate, poly(oxypropylene glycol) (POPG) (M = 1000) and trimethylolpropane (TMP) as a cross-linking agent, polyhydroxyethyl methacrylate (PHEMA) and poly(titanium oxide). Poly(titanium oxide) was formed by in-situ sol-gel method in an environment of POPG using titanium isopropoxide (TIP). The component ratio of PU/PHEMA in the initial and organo-inorganic IPNs was 70/30, 50/50, 30/70 wt % and the content of titanium isopropoxide was 0.5 wt %. Initial and OI IPNs have been investigated by the thermogravimetric analysis (TGA) and by testing samples for the mechanical strength at break point (σ, MPa) and determining values of relative lengthening (ε,%).

The results of the thermogravimetric analysis of OI IPNs have shown that these polymeric systems have three characteristic temperature regions of weight loss during thermo-oxidative destruction. The minimum mass loss was observed in the range of 200-400 $^{\circ}$C. The increased resistance to the thermal oxidative destruction and an increase of the maximum decomposition temperature for 20 $^{\circ}$C is due to an increase in the content of PHEMA-component.

Mechanical properties (strength at break and relative lengthening) depend on the variation of the ratio of PU / PHEMA. A specimen of organic-inorganic IPNs with the highest content of the acrylate component is characterized by the highest value of strength at break (σ = 27,11 MPa) and an insignificant relative lengthening.