

Nanocomposites and nanomaterials

Structure-properties relationship in organic-inorganic nanosystems based on sodium silicate

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Over the last years the interfacial interactions in organic-inorganic polymer composites (OIC) consisting of a polyurethane organic phase and a mineral inorganic phase are intensively studied because of great prospective in producing nanoheterogeneous composites with novel functional characteristics.

Here an effect of chemical reactivity and concentration of NCO groups in the macrodiisocyanate (MDI) or its blends with polyisocyanate of organic phase on interfacial interactions, sorption and mechanical properties of OIC based on sodium silicate has been studied. MDI with NCO groups content in the range of 3,6-11,8 % was prepared from poly(propylene glycol) of M_w 1000 or 2000 and tolylene diisocyanate (mixture of 2,4/2,6-isomers). Hybrid polymer systems were prepared by the joint polycondensation of the organic phase with unmodified or polyacrylic acid modified aqueous sodium silicate [1-3].

The reaction between NCO groups of organic phase and silanol groups of inorganic phase during formation of the composites is confirmed by FTIR. Increasing a content of highly reactive NCO groups of tolylene-2,4-diisocyanate in organic phase improves covalent interactions at the interface. Improvement of interface interactions and formation of hydrophobic urethane-silicate layer decrease water sorption ability and enhance mechanical properties of the composites obtained using unmodified as well as polyacrylic acid modified sodium silicate.

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