"Nanotcomposites and nanomaterials"

Dodecyl sulfate intercalated layered double hydroxides as fillers for polyurethane nanocomposites

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Polyurethanes (PU) are extraordinarily versatile polymeric materials which can be tailored to meet the highly diversified demands of modern technologies such as coatings, adhesives, foams, and thermoplastic elastomers. However, the application of polyurethane is restricted by its low tensile strength and thermal stability. LDHs as nanofillers improve various technical properties (such as mechanical, thermal and barrier) of polymer matrices.

There are three principal options to obtain polymer/LDHs nanocomposites: (i) intercalation of the monomer molecules followed by in-situ polymerization ;(ii) direct intercalation of polymer; (iii) physical modification of the polymers with layered materials.

In this work, a monomer surfactant, sodium dodecyl sulfate (SDS) is incorporated into Mg-Al LDHs galleries and the resulting organic–inorganic ‘‘sandwich’’ structure is subsequently dispersed into macro diisocyanate matrix. The physical-mechanical properties of synthesized composites contained 0-8 % wt of Mg-Al/SDS LDHs were studied.

Analysis of tensile properties showed significant improvements in tensile strength (TS) and elongation at break (EB) of about 83% and 1185% for PU/SDS-LDHs (5 wt%) nanocomposite. In addition, gradual improvement in thermal stability with increasing SDS-LDHs loading makes these nanocomposites versatile and hence suitable for many critical applications. The obtained results are comparable with the results obtained for PU/SDS-LDHs systems prepared by direct intercalation of polymer with the organo-modified MgAl-LDHs. We have shown that the physical modification of polyurethane prepolymer with dodecyl sulfate intercalated LDHs is a method of the potential application for introduction of organo LDHs nanofillers into the polymer matrix.