

In-situ preparation of polyurethane-clay nanocomposites in the presence of Maghnite as an inorganic reinforcement for multifunctional mechanical properties

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Abstract. For the first time, polyurethane-based composites/nanocomposites (PU-Magx) were synthesized using Maghnite as an inorganic reinforcement. Maghnite is a smectite-type laminar clay with a specific surface area of 786 m²/g. It is characterized by a relatively higher SiO₂/Al₂O₃ ratio compared to other world clays. The interfacial cations of Maghnite can be active sites during the reaction, which gives it a catalytic aspect. This was the reason why in-situ polymerization method was chosen for PU-Magx synthesis. The X-ray diffraction (XRD) study showed that the organophilic Maghnite (Mag-CTAB), treated with cetyl trimethylammonium bromide, exhibits a very large interlayer distance compared to sodium Maghnite (Mag-Na) and raw Maghnite. Different PU-Magx formulations were prepared by introducing 1, 3, 5, 7 and 10% of Mag-CTAB. The chemical structure of pure PU and PU-Magx has been confirmed by infra-red (IR) and 1H MAS NMR spectroscopy. The dispersion of the sheets in the PU matrix were studied by transmission electron microscopy (TEM). The Young's modulus and the yield strength were calculated in order to evaluate the mechanical behavior of PU-Magx.

Keywords: Polymeric matrix; Clay; reinforcement; Polyurethane; Maghnite