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Synthesis and Mechanical Characterization of Polyurethane Reinforced with Halloysite Nanotubes RAFAELA AGUIAR, OREN PETEL, RONALD MILLER, ANTON LEBAR, ANDREW ODDY, Carleton University — Polymer composites containing nano-additive reinforcements have attracted much attention in recent years, enabling tunable properties that benefit certain material applications. In the present work, Halloysite nanotubes (HNT) are introduced into polyurethane at various concentrations to produce a series of nanocomposites. HNT is a natural nanotube formed by surface weathering of aluminosilicate minerals. These polymer nanocomposite systems are investigated for their material properties under quasi-static loading and high-strain-rate conditions. Given that HNT are small enough to be dispersed at the scale of the macromolecular structure of the polymeric matrix, and due to the chemical interaction between the HNT and polyurethane, there is a reinforcement of the polymer matrix at the macromolecular level. HNT was incorporated into poly(propylene glycol), tolylene 2,4-diisocyanate based polyurethanes, with different chain extenders, 4,4'-methylenebis(2-chloroaniline) and 1.4-butanediol. The degree of chemical interaction between HNT and polyurethane was analysed by Fourier-transform infrared spectroscopy study. The nanocomposite was characterized by using differential scanning calorimetry, scanning electronic microscopy, thermal gravimetric analysis, spall and tensile testing. The reinforcement of the polymer is seen through comparisons of the ultimate tensile strength, strain to failure and spall strength for the pristine and nanocomposite polymer.

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