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Effect of filler surface properties on stress relaxation behavior of carbon nanofiber/polyurethane nanocomposites I. SEDAT GUNES, GUILLERMO JIMENEZ, SADHAN JANA, The University of Akron — The effect of carbon nanofiber (CNF) surface properties on tensile stress relaxation behavior of CNF/polyurethane (PU) nanocomposites was analyzed. PU was synthesized from methylene diisocyanate, polypropylene glycol (PPG diol), and butanediol. CNF, oxidized CNF (ox-CNF), and PPG diol grafted CNF (ol-CNF) were selected as fillers. ol-CNF was obtained by grafting PPG diol onto ox-CNF by reacting it with the carboxyl groups present on ox-CNF surface. The atomic ratios of oxygen to carbon present on the filler surfaces were 0.13 and 0.18 on ox-CNF and on ol-CNF as compared to 0.015 on CNF, mostly due to the presence oxygen containing polar groups on the surfaces of the former. The composites were prepared by in-situ polymerization and melt mixing in a chaotic mixer. The stress relaxation behavior of composites was determined at room temperature after inducing a tensile strain of 100%. The presence of fillers augmented the rate of stress relaxation in composites which was highest in the presence of CNF. The results suggested that relatively weak polymer-filler interactions in composites of CNF promoted higher stress relaxation.

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