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Organically Modified Nanoclay-Reinforced Rigid Polyurethane Films YONG TAE PARK, Department of Chemical Engineering and Materials Science, University of Minnesota, YUQIANG QIAN, Department of Chemistry, University of Minnesota, CHRIS LINDSAY, Huntsman Polyurethanes, ANDREAS STEIN, Department of Chemistry, University of Minnesota, CHRISTOPHER MACOSKO, Department of Chemical Engineering and Materials Science, University of Minnesota — The nanodispersion of vermiculite in polyurethanes was investigated to produce organoclay-reinforced rigid gas barrier films. Reducing gas transport can improve the insulation performance of closed cell polyurethane foam. In a previous study, the dispersion of vermiculite in polyurethanes without organic modification was not sufficient due to the non-uniform dispersion morphology. When vermiculite was modified by cation exchange with long-chain quaternary ammonium cations, the dispersion in methylene diphenyl diisocyanate (MDI) was significantly improved. Dispersion was improved by combining high intensity dispersive mixing with efficient distributive mixing. Polymerization conditions were also optimized in order to provide a high state of nanodispersion in the polyurethane nanocomposite. The dispersions were characterized using rheological, microscopic and scattering/diffraction techniques. The final nanocomposites showed enhancement of mechanical properties and reduction in permeability to carbon dioxide at low clay concentration (around 2 wt percent).

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