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Oxygen Permeation as a Quantitative Means of Ranking Exfoliation in Polymer-Clay Nanocomposites. KOSMAS G. KASIMATIS, CYNTHIA PIERRE, AMANDA M. WALKER, JOHN M. TORKELSON, Northwestern University, Evanston, IL 60208 — A series of polymer-clay nanocomposites have been made by solid-state shear pulverization (SSSP), which yields good exfoliation of clay based on x-ray diffraction and transmission electron microscopy results, and by melt mixing, which yields relatively little exfoliation of clay based on similar characterization. Here we demonstrate the utility of oxygen permeation as a quantitative tool for ranking exfoliation levels in polymer-clay nanocomposites; the basis for this approach is related to the fact that greater exfoliation of clay will lead to a more tortuous diffusion path for oxygen in the polymer matrix and thereby a reduction in permeability coefficient. A greater than factor of 3 reduction in permeability coefficient has been achieved in polymer clay nanocomposites processed by SSSP. A comparison of permeation results will be made to other characterization and properties that are known to reflect exfoliation.

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