

Abstract Submitted
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Influence of Clay Platelet Spacing on Oxygen Permeability of Thin Film Assemblies MORGAN PRIOLO, Texas A&M University, DANIEL GAMBOA, JAIME GRUNLAN — Thin films of anionic natural montmorillonite clay and various polyelectrolytes have been produced by alternately dipping a plastic substrate into dilute aqueous mixtures containing each ingredient in an effort to show the influence of clay platelet spacing on thin film permeability. After polymer-clay layers have been sequentially deposited, the resulting transparent films exhibit a brick wall nanostructure comprised of completely exfoliated clay bricks in polymeric mortar. This brick wall forms an extremely tortuous path for a molecule to traverse, creating channels perpendicular to the concentration gradient that increase the molecule's diffusion length and delay its transmission. To a first approximation, greater clay spacing (i.e., reduced clay concentration) produces greater oxygen barrier. Oxygen transmission rates below $0.005 \text{ cm}^3/\text{m}^2\cdot\text{day}$ have been achieved for films with only eight clay layers (total thickness of only 200 nm). With optical transparencies greater than 86% and the ability to be microwaved, these thin film composites are good candidates for flexible electronics packaging and foil replacement for food.

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