

Abstract Submitted  
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**Tunable Gas Permeability of Polymer-Clay Nano Brick Wall Thin Film Assemblies** DANIEL GAMBOA, MORGAN PRIOLO, JAIME GRUNLAN — Thin films of anionic natural montmorillonite (MMT) clay and cationic polyethylenimine (PEI) have been produced by alternately dipping a plastic substrate into dilute aqueous mixtures containing each ingredient. After 40 polymer-clay layers have been deposited, the resulting transparent film exhibits an oxygen transmission rate (OTR) below  $0.35 \text{ cm}^3/\text{m}^2 \cdot \text{day}$  when the pH of PEI solution is 10. This low permeability is due to a brick wall nanostructure comprised of completely exfoliated clay bricks in polymeric mortar. This brick wall creates an extremely tortuous path at thicknesses below 250 nm and clay concentration above 80 wt%. A 70-bilayer PEI-MMT assembly has an undetectable OTR ( $< 0.005 \text{ cm}^3/\text{m}^2 \cdot \text{day}$ ), which equates to a permeability below SiO<sub>x</sub> when multiplied by its film thickness of 231 nm. With optical transparency 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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