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## **Study on the Mechanical Properties and Oxygen Permeability of Layered Silicate-Polyethylene Nanocomposite Films**

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An organically modified montmorillonite was compounded with EVA, LDPE, and HDPE. The three resulting nanocomposites exhibited intercalated structures. They were further blown into films. Mechanical properties and oxygen permeability of these nanocomposite films were investigated to study the effects of the clay on the different types of polyethylene. The results showed that the addition of 5 wt. % clay doubles the tensile modulus of EVA and lowers the oxygen permeability of the EVA film by 50%. When LDPE and HDPE are compounded with organoclay, a maleic anhydride grafted polyethylene (MAPE) must be used as compatibilizer. We found that the MAPEs have a deteriorating effect on the oxygen permeability of the LDPE and HDPE. For LDPE, the addition of 5 wt.% MAPE increases the oxygen permeability by 25%. After incorporating 5 wt.% clay, the oxygen permeability reduces 30% and the tensile modulus increases ~ 40%. The oxygen permeability of LDPE/clay/MAPE 90/5/5 system is ~15% lower than that of the neat LDPE. For HDPE, the addition of 5 wt. % MAPE, so far, leads to a three-fold increase of oxygen permeability. Incorporating 5 wt.% clay cannot improve the situation. Also, the 5 wt. % clay cannot noticeably reinforce the HDPE. Preliminary conclusions from this study are: (1) a small amount of organoclay (~5 wt.%) can significantly enhance the mechanical and oxygen barrier properties of EVA; (2) ~ 5 wt. % clay does not improve the properties of HDPE; (3) a small amount of MAPE can be mixed with HDPE for applications where high oxygen permeability is required; (4) lowering the compatibilizer loading in a LDPE system may be needed to further improve the oxygen barrier properties.