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EFFECT OF CLAY PURIFICATION AND ORGANIC MODIFICATION ON THE MECHANICAL AND BARRIER PROPERTIES OF LLDPE/BENTONITE FILMS

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This work is concerned with the preparation and characterization of plane films of nanocomposites of linear low density polyethylene (LLDPE) and bentonite clay. Bentonite is a widely distributed clay whose major component is the expandable layered silicate mineral montmorillonite. The clay was added to the matrix in natural form, purified to eliminate organic matter and mineral impurities, and purified and organically modified to increase its affinity to the hydrophobic apolar polymer matrix (purification and organophilization procedures were developed in our laboratories and reported elsewhere). A masterbatch with 70% LLDPE and 30% bentonite was prepared in an internal mixer, and let down with LLDPE to 1% by weight of clay in single-screw extruder with a mixing elements, where plane films of 20-50 mm thickness. The films were tested for mechanical properties and the permeability to water vapor was measured. Compared to the neat LLDPE matrix, results show a significant increase of tensile strength (67 to 92 %) and resistance to perforation (10 to 21 %) on films prepared with purified and organically modified clay. In contrast, a moderate drop in mechanical properties was observed in films prepared with natural clay. Permeation of water vapor tests show a significant increase in the permeability (109 to 57 %) in the films prepared with purified and organically modified clay.