607c Morphology and Properties of Blown Films Prepared from Ionomer-Organoclay Nanocomposites

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Poly(ethylene-co-methacrylic acid) ionomers are being extensively used in a wide variety of packaging applications. These polymers offer high hot tack strength, low sealing temperatures, high clarity, and good formability, which have led to their increased popularity as high performance, cost-effective packaging materials.

In this study, we have tried to improve the mechanical and barrier properties of such ionomers by melt mixing them with organically modified montmorillonite clay minerals. The organoclay structure and melt processing conditions were optimized to form nanocomposites with high levels of exfoliation. Our work has shown that organic modifiers with multiple long alkyl tails lead to higher levels of organoclay exfoliation in these ionomers than those having a single alkyl tail. This is believed to be the result of the higher affinity that these matrices have for the largely aliphatic organic modifier than for the pristine surface of the aluminosilicate clay.

The nanocomposites prepared were then blown into films using the “in-pocket” or “low-stalk” configuration at two different blow-up ratios (2:1 and 3:1) and three draw-down ratios (7,14 and 21) to determine the effect of platelet orientation and film morphology on performance. The puncture resistance (dart impact strength) and the resistance to tear propagation of the nanocomposite films in the machine direction (MD tear) and transverse direction (TD tear) were evaluated and the properties were compared to those of the corresponding unfilled polymer films. These results will be discussed in detail along with the permeability coefficients for O2, N2 and CO2 gases determined using a constant-volume-variable pressure method. A comparison between the mechanical and barrier properties of these films and those prepared from LDPE-organoclay nanocomposites will also be presented.