Polyolefin-Layered Silicate Nanocomposites for Foamed and Melt Blown Products
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Linear polypropylene (PP) or polypropylene chains devoid of branches or crosslinked structure—and blends of PP with olefinic elastomers are widely used in the automotive and packaging industries. The production of closed-cell foams with linear PP is difficult because the melt does not exhibit strain hardening under extensional flow. We have developed nanocomposite formulations that yield both good dispersion and strain hardening in melt extensional flows. Figure 1 shows a comparison of foam cell structure obtained by extruding the linear PP and five different nanocomposites (NC) with a chemical blowing agent. Measurements of uniaxial extensional viscosity transients were carried out at 180°C, for linear PP and these five NCs. We observed that the linear PP and the NC melts labeled N2 and N1 did not show any strain hardening in extensional flow while the NC melts labeled S1, S2, and S6 exhibited strain-hardening properties. The latter can be used to produce foams with very good cell structure as seen in Figure 1.

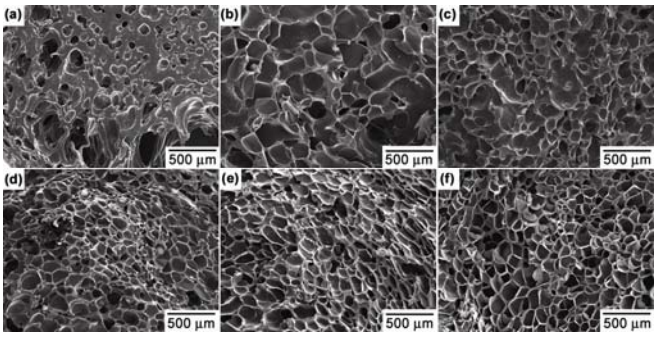

Fig. 1 SEMs of extruded foam samples for (a) linear PP (b) PPNC-N2 (c) PPNC-N1 (d) PPNC-S1 (e) PPNC-S2 (f) PPNC-S6

Another area of application for such compounds is in melt blowing of high molecular weight high density polyethylene (HMW-HDPE) sheets used in the automotive industry. Combining dispersion of layered silicates in this material with rheology modifications similar to those described above will lead to controllable and reduced thickness while maintaining the properties.