**PPS-20 Symposium Akron (Natarajan-Abstr-5) Session requested: Oral/Poster**
**Topic Session: Polymer Nanotechnology / Composites**

# Effect of Organic Amine Structure, Grafting Density, Layered Silicate and Processing Conditions on Structure, thermal and mechanical properties of Several New Acrylonitrile-Styrene-Butadiene (ABS)-Clay Nanocomposites

Upendra Natarajan, Radhika Aluru and Rajkiran Tiwari
Polymers Division, National Chemical Laboratory (N.C.L.)
Pune 411008, INDIA
[mailto:upendra@poly.ncl.res.in]

## Abstract

Several new intercalated and exfoliated nanocomposites of acrylonitrile-butadiene-styrene (ABS) resin with layered silicates were obtained by melt state processing route and are reported here. We looked at the effect of organic modifier structure of the clay in case of montmorillonites (MMT) and also at the effect of clay layer size by utilizing laponite clay. The nanocomposites were characterized using X-Ray diffraction, DSC and TGA. The effect of clay weight loading on the nanocomposite d-spacings and its thermal stability and properties were investigated. The tensile modulus of the nanocomposites are superior to that of the unfilled polymer by 4% - 30% depending on the type of clay, at similar and low loadings such as just 4% by wt. clay in the hybrid. d-spacings of the hybrids by the batch mixer route, are not affected by using rotor speeds higher than 60 rpm. There is significant increase in several mechanical properties such as stress at auto-break, modulus, tensile strength by the formation of intercalated nanocomposites, while strain at auto-break significantly decreases due to the presence of intercalated clay. At low and reasonable loadings, the yield stress of the intercalated nanocomposite prepared using organically modified montmorillonites are higher than that of ABS, while yield stress of ABS-$Na^{+}$MMT composite is not much different from that of ABS. Both notched as well as unnotched impact strengths of the nanocomposites are inferior to that of ABS, except in two nanocomposites where an increase in the impact has been observed. Use of 30nm sized laponite clay leads to exfoliated nanocomposites and an improvement in impact strength (ductility) compared to the polymer. Results on the intercalation, thermal and mechanical properties will be presented. Results using different processing equipments such as Brabender batch mixer (50 g scale), large scale twin-screw extruder (700 g scale), and DSM twin-screw extruder/compounder (5g scale) will be presented.