323f Mechanical and Gas Barrier Properties of Styrene-Butadiene Rubber (Sbr) Nanocomposites Containing Organoclays and Carbon Black

Paulo C. Meneghetti, Sohel Shaikh, Syed Qutubuddin, and Sergei Nazarenko

SBR/organoclay nanocomposites filled with carbon black (CB) were synthesized via mechanical mixing using a Brabender mixer and a 2-roll mill. Montmorillonite (MMT) clay was functionalized with either octadecyldimethyl betaine (C18DMB) or vinylbenzyl-octadecyldimethyl ammonium chloride (VODAC) surfactant. X-ray diffraction and transmission electron microscopy verified the intercalated nano-structure and also revealed partial exfoliation. The synergism of organoclay and CB resulted in property enhancements equivalent to 40 phr CB at just half the total filler loading (10 phr each of CB and organoclay). The tensile strength increased to 31 MPa (660% higher than SBR) and the hardness increased to 61 Shore-A (33% improvement over SBR). Similar improvements were also observed in the dynamic mechanical properties and oxygen permeability. These results indicate that a mixture of organoclay and CB can substantially reduce the total filler loading in SBR nanocomposites.