

Preparation and properties of natural rubber/layered Double hydroxide nanocomposites

ABSTRACT

Nanocomposites of natural rubber (NR)/organo ZnAl layered double hydroxide (ZnAl LDH-DS) were successfully synthesized and characterized. A hydrophilic Zn-Al layered double hydroxide (ZnAl LDH-NO₃⁻) was converted into the organophilic form by replacing the nitrate ion in between the ZnAl LDH-NO₃⁻ with dodecylsulfate ion (DS) to form ZnAl LDH-DS. The melt intercalation technique followed by vulcanization process was adopted to synthesize the nanocomposites of NR/ZnAl LDH-DS. Intercalation of DS ion into the interlayer of ZnAl LDH-NO₃⁻ increased the surface area and the porosity of the LDH. X-Ray diffractogram of the organophilic ZnAl LDH-DS shows that the basal spacing of the ZnAl LDH-NO₃⁻ expands from 0.89 to 2.53 nm due to the accommodation of DS ion in the intergallery. After the compounding process with the NR, the basal spacing of ZnAl LDH-DS in the composites is increased to 3.90 and 3.27 nm when the ZnAl LDH-DS contents were 1 and 15 phr, respectively. Transmission electron microscope image revealed that the ZnAl LDH-DS was distributed in the NR matrix in such a way of exfoliated and different grade of intercalated. The tensile strength values of NR/ ZnAl LDH-DS (nanocomposites) were found to be higher than that of the NR/ZnAl LDH-NO₃⁻ (macrocomposites).

Keyword: Nanocomposites; Layered double hydroxide; Natural rubber; Intercalate