

Preparation and characterization of natural rubber/layered double hydroxide nanocomposites

ABSTRACT

Nanocomposites of organo Zn-Al layered double hydroxide (LDH) with natural rubber (SMR CV60) were successfully synthesized and characterized. To prepare the nanocomposites, a hydrophilic Zn-Al layer double hydroxide (ZnAl LDH -NO₃) was first converted into the organophilic form by using dodecylsulphate ion (DS) as a guest in Zn-Al layer double hydroxide (ZnAl LDH-DS). Intercalation of dodecylsulphate anion into the interlayer of LDH increased the surface area and the porosity of LDH. Nanocomposites of NR / ZnAl LDH-DS was then prepared by melt intercalation method using Haake internal mixer. The resulting compounds were then vulcanized using the conventional method. X-Ray diffractogram the organophilic ZnAl-DS LDH shows the basal spacing of the ZnAl-LDH expands from 0.89 nm with nitrate as the intergallery anions to 2.53 nm due to the accommodation of DS surfactant anions. After the compounding with the natural rubber, the basal spacing of ZnAl LDH-DS in the composites is increased to 3.90 and 3.66 nm when the Zn-Al-LDH-DS contents are 1 phr and 15 phr respectively. TEM revealed the layered double hydroxide generally uniformly distributed in the rubber matrix. Further characterization indicates that the tensile strength of NR/ Zn-Al LDH-DS (nanocomposites) is higher than that of the NR/Zn-Al LDH-NO₃ (macrocomposites).

Keyword: Layered double hydroxide; Melt blending; Nanocomposites; Natural rubber