World Academy of Science, Engineering and Technology
International Journal of Materials and Textile Engineering
Vol:17, No:09, 2023

Evaluation of Barium Sulfate and Its Surface Modification as Reinforcing Filler for Natural and Some Synthetic Rubbers

Authors : Mohamad Abdelfattah Ibrahim Elghrbawy

Abstract : This work deals to evaluate barium sulfate (BS) before and after its surface modification as reinforcing filler for rubber. Barium sulfate was surface-modified using polymethacrylic acid (PMAA), the monolayer surface coverage of barium sulfate by polymethacrylic acid molecules occurred at 5.4x10-6 mol/g adsorbed amount. This amount was sufficient to reduce the sediment volume from 2.65 to 2.55 cm3/gm. Natural rubber (NR) was compounded with different concentrations of barium sulfate. The rheological characteristics of NR mixes were measured using a Monsanto Oscillating Disk Rheometer. The compounded NR was vulcanized at 142°C, and the physico-mechanical properties were tested according to the standard methods. The rheological data show that the minimum torque decreases while the maximum torque increases as the barium sulfate content increase. The physico-mechanical properties of NR vulcanizates were improved up to 50 phr/ barium sulfate loading. On the other hand, styrene–butadiene rubber (SBR) and nitrile–butadiene rubber (NBR) rubbers compounded with 50 phr/barium sulfate had good rheological and mechanical properties. Scanning electron microscope studies show surface homogeneity of rubber samples as a result of good dispersion of surface modified barium sulfate in the rubber matrix. The NR, SBR and NBR vulcanizates keep their values of mechanical properties after subjected to thermal oxidative aging at 90°C for 7 days.

Keywords : barium sulfate, natural rubber (nr), nitrile–butadiene rubber (nbr), polymethacrylic acid (pmaa), styrene–butadiene rubber (sbr), surface modification
Conference Title : ICMPC 2023 : International Conference on Materials and Polymer Chemistry
Conference Location : Vancouver, Canada
Conference Dates : September 25-26, 2023