(129)

Development of a Novel Tread Compound using Rice Husk Ash for Non-Marking Solid Tyres

Dilani K.P.R.I.[1*], Gunesekara T.D.[2], Ratnaweera D.[1] Etampawala T.[2], Gunesekara D.[3]

[1]Department of Chemistry, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
[2]Department of Polymer Science, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
[3]Trelleborg Lanka (Pvt) Ltd., Makola, Kelaniya, Sri Lanka
**randidilani@sjp.ac.lk*

Abstract

Rice husk is an agro waste that is not used in valuable ways especially in Sri Lanka other than as an alternative energy source. The conventionally burnt rice husk contains about 80-90% silica. Thus, these rice husk ash (RHA) could be a good replacement for commercially used silica filler in non-marking tread compounds. This study dedicated to research on possibility of using RHA and amorphous silica extracted from RHA as filler in non-marking tread compounds. The ash color RHA was obtained from conventionally burnt of rice husk at high temperature (550° C-700° C). The sodium silicate slurry was obtained by dissolving RHA in sodium hydroxide, heated above 140° C and stirred for 4 hrs. The slurry was filtered and filtrate was used to produce silica gel using sulphuric acid. This reaction was taken place at temperature 80° C-90° C range. The addition of sulphuric acid was done very slowly until medium become acidic. This was observed by using litmus papers. Then gel was allowed to age for overnight and formed silica gel was filtered and allowed to dry. The formed silica was purified by dissolving in hydrochloric acid, filtered it and residue was washed thoroughly with distilled water to remove metallic ions and sulphate impurities. The white color silica was obtained. Conventionally burnt RHA was blended with commercially used silica filler with different ratios and then formulated a tread compound. The controlled sample was made using commercially used silica filler. Another set of tread compound with same amount of filler loadings was prepared by adding Poly Ethylene Glycol as a coupling agent. MDR test for rheological properties, tensile and tearing tests, hardness and SPG tests, heat build-up test, abrasion and resilience tests were carried out for all the samples. Even though, rice husk ash contains high silica percentage the sample with 100% replacement of commercial silica with RHA showed worst mechanical properties, which improved with decreasing the RHA content. However, significant improvements in mechanical properties were observed when amorphous silica extracted from RHA was used. The characterization of extracted silica confirms that the presence of impurities such as metals and metal oxides. Thus, further improvements are being carrying out with further purification and modification of extracted silica.

Keywords: Silica, Rice husk, Rice husk ash, Non-marking solid tyre, Tread compound