Silica Extracted from Rice Husk Ash as an Effective Reinforcing Filler for Natural Rubber Composites

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Rice husk is abundantly available in Sri Lanka, which is generated in larger volumes as rice husk ash (RHA) due to combustion. In general, RHA dumped at landfills as a waste. However, RHA is a promising source of silica as it contains more than 90% by weight. This silica can effectively be extracted by Sol-Gel method. In this research such silica was extracted and characterized using Fourier Transform Infrared Spectroscopy (FTIR) and X-ray Diffractometry (XRD). Both FTIR and XRD analysis confirmed the chemical and amorphous nature of the extracted silica. Natural rubber composites were prepared incorporating silica from 0-10 parts per hundred Rubber (phr) at 2.5 phr intervals using two-roll mill. The effect of silica on curing characteristics and the mechanical properties of vulcanizates were studied. The curing characteristics of the compounds revealed an increase in cure rate and thus considerable decrease in cure time and scorch. Tensile strength, modulus at 100% elongation and tear strength has increased significantly compared to control sample. The effect is prominent with increasing the silica loading. The abrasion volume loss has significantly decreased with the increase of silica loading. The lowest abrasion volume loss and the highest tear strength have reached at 7.5 phr of silica loading level. Whilst the resilience has decreased when increase the silica loading. However, silica loading does not show an impact on hardness. In conclusion, preferred curing characteristics and improved mechanical properties have been achieved. Moreover, it is important to emphasize that in this study the effect of extracted silica on mechanical properties of NR composites has not been compared with the commercially available silica and further studies are suggested.

Keywords: Natural rubber composites, Rice husk ash, Silica