PREPARATION AND APPLICATION OF RICE HUSK SILICA IN RUBBER PRODUCTS

M.S. Mrudula, N. Vaishak, Parvathy S. Kumar, M. Shaheen, Nila Natesh, Shera Mathew and Siby Varghese*

Rubber Research Institute of India, Kottayam, Kerala-686 009, India

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Extraction of silica from rice husk ash (RHA) is a sustainable route for the manufacture of silica and it is also a solution for the disposal of large amount of rice husk (RH) generated from paddy fields. The objective of this work was to isolate the silica from RHA and to explore its use as a filler in rubber products. Accordingly, a chemical method was proposed for the preparation of silica by dissolving RHA in sodium hydroxide followed by filtration and precipitation using sulphuric acid with 85 per cent yield. The cure characteristics and mechanical properties of natural rubber vulcanizates loaded with RHA silica in comparison to those prepared using Ultrasil VN3 grade silica were examined. The compounds reinforced with RHA silica showed fast cure behaviour compared to Ultrasil VN3. The mechanical properties of rubber vulcanizates reinforced with RHA silica were comparable with Ultrasil VN3. Experiments with prevulcanized latex showed that RHA silica can be used as a potential filler for conventional latex products. The overall results indicated that RHA can be used as a cheaper filler for both latex and dry rubber products.

Keywords: Composites, Fillers, Natural rubber, Rice husk ash (RHA), Ultrasil VN3

INTRODUCTION

Paddy is the major seasonal crop cultivated in India and is a primary food source of the people. Rice husk (RH) is the major waste by-product of paddy. Tonnes of RH are being produced by rice mills annually and the disposal becomes a great problem. Approximately 22 kg of husk is generated from every 100 kg of rice produced. India produces around 110 million metric tonnes of rice every year. Even though some end products like adsorbent, feedstock *etc*. are produced from RH and are also used as a fuel in boilers, large part of this is burnt openly. This results in a huge quantity of rice husk ash (RHA) being accumulated which causes environmental issues at the dumping land and its surroundings. Accordingly, effective management of this waste material is the need of the day.

Composition of RH is 20 per cent ash, 38 per cent cellulose, 22 per cent lignin, 18 per cent pentose and two per cent other organic components (Adam *et al*., 2012; Sheeba *et al*., 2017; Azat *et al*., 2019). RHA is a major source of silica with 80-90 per cent silica content. The high silica content of RHA compared to other agricultural waste makes it a valuable raw material to many industries such as refractory industry, polymer, cement, cosmetics, electronics,

*Correspondence: Siby Varghese (Email: siby@rubberboard.org.in)