Preparation and Optimization of Banana Fiber Reinforced Natural Rubber Composites

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Agro-industrial waste has become a major environmental issue in most parts of the world. Banana trees are one of the major underutilized agro by-products generated, especially in Sri Lanka. Natural fiber reinforced bio-degradable composites are good alternatives for composites produced with conventional materials. Banana fibers are cheaper, environmentally friendly, renewable and biodegradable. This work was aimed to evaluate the feasibility of utilizing fiber extracted from banana stem with natural rubber to develop a composite with enhanced mechanical properties, especially for flooring products. In this study, banana fibers were extracted and characterized using Fourier-transform Infrared (FTIR) spectroscopy. The surface of the banana fibers was modified using NaOH and Na_2SO_3. The surface modification was confirmed by FTIR spectroscopy. Natural rubber-based composites were prepared with different levels of banana fiber loadings with other compounding chemicals. Physico-mechanical properties of the composites such as hardness, compression set, abrasion volume loss, tensile properties and tear strength were evaluated. These properties of the composites were compared with those of the composite prepared according to the same formulation, but without banana fiber (i.e. control). Compared to the Control, novel banana fibre-filled natural rubber composites show improved mechanical properties such as lower compression set, higher abrasion resistance and higher hardness. It can be concluded that, within the limited scope of the experiments carried out in this investigation, this banana fibre-filled natural rubber composites could be utilized as a flooring material.

Keywords: Banana fiber; Natural rubber; Composite; Reinforcement