

Crumb Rubber and Silica Nano Particle Derived Rubber Floor Tiles: A Partial Solution for Waste Management

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Currently, crumb rubber derived flooring is a small, but growing sector in the world floor coverings market. However it is not widely spread in Sri Lanka. Such flooring includes mats, rolls, sheets, and indoor and outdoor tiles. Among the materials used for flooring, natural rubber blended with synthetic rubber is one of the low cost and commonly used ingredients. However, the pristine rubber blends show retarded mechanical properties. Thus, reinforcement with additives and vulcanization is commonly practiced technique. In this research the blend of natural and synthetic rubber is reinforced with crumb rubber and silica nano particles. Both of these additives were prepared from the waste materials. Thus, this research is focused to introduce a partial solution for waste management. The idea is analogues to making large particle reinforced composites such as concretes in which two different sizes of particles (coarse gravel and sand) are densely packed with an adhesive (cement). In this study, fine rubber crumbs of four different sizes in the range of 3.15 mm to 500 m were prepared by mechanical grinding. Silica was extracted from rice husk and further purified before preparing the silica nano particles by precipitation method. They were further characterized using Fourier transform infrared spectroscopy (FTIR) and X-ray diffraction (XRD) analysis. FTIR peaks confirm the presence of O-H, Si-O and Si-O-Si bonds in nano silica. The broad peak between 22° and 23° (2) in XRD data revealed that silica nano particles were in amorphous form. The composite materials were prepared with different ratios of rubber: silica nano particles: crumb rubber. The samples with same compositions but different rubber crumb sizes were also prepared. All the composites were further reinforced by vulcanization with sulfur. The tensile and compression tests were done to evaluate their mechanical properties.

Keywords: Rubber floor tiles, Silica nano particles, Crumb rubber, Rubber vulcanization