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# Hardened properties of concrete mixtures containing pre-coated crumb rubber and silica fume

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## Abstract

Loss of mechanical strength and relatively high variability in durability performance are major factors preventing large-scale utilization of scrap tire waste in concrete. This study examines an approach to pre-treat crumb rubber in conjunction with the addition of supplementary cementitious materials in order to mitigate the loss of mechanical properties in rubberized concrete. The mechanical and durability properties of concrete composites containing as-received and limestone powder pre-coated crumb rubber at 0 %, 5 %, 10 % and 15 % fine aggregate substitution by volume are investigated. In addition, some mixtures also contain silica fume at 15 % cement replacement by volume. The results reveal that although the strength improvement due to coated crumb rubber alone was minor, the synergistic effect of coated crumb rubber and silica fume as cement replacement material enhanced the mechanical properties of mixtures significantly. Moreover, both as-received and pre-coated crumb rubber acted as an electrical insulator increasing the surface resistivity and chloride permeability resistance of concrete.

**Keywords:** Crumb rubber; concrete; mechanical strength; resistivity; chloride permeability

## 1. Introduction

Presently, the recycling of waste by-products is an integral part of waste management policies in most countries of the world. The main benefits of waste recycling are reduction in environmental pollution and conservation of natural resources. For the construction industry, sustainability in

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