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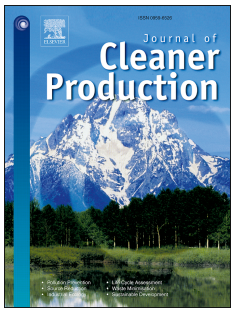

Effects of surface pre-coating and silica fume on crumb rubber-cement matrix interface and cement mortar properties

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Effects of surface pre-coating and silica fume on crumb rubber-cement matrix interface and cement mortar properties

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Poor crumb rubber-cement matrix interface contributes to the reduction in mechanical strength observed in cement composites containing recycled scrap tires as fine aggregate. In this paper, the efficacy of a two-stage approach of using limestone powder (LP) pre-coated crumb rubber and silica fume (SF) to enhance the performance of rubberized cement mortar was investigated. LP pre-coated crumb rubber at 0%, 5%, 10% and 15% volume substitution of fine aggregate, and SF at 10% volume cement replacement were used. Mortar compressive strength, flexural strength, abrasion resistance, cement paste-crumb rubber interface and sorptivity were evaluated. As-received crumb rubber generally reduces the mechanical strength of mortar. However, in comparison to the reference mixture, comparable compressive strength and higher flexural strength were obtained in mixtures containing SF and up to 10% LP pre-coated crumb rubber. Optical micrographs showed that enhanced crumb rubber-cement paste interface and matrix densification are the main reasons for the strength enhancement. Moreover, the addition of crumb rubber to mixtures reduced the sorptivity of rubberized mortar.

Keywords: Crumb rubber; mortar; interfacial gap; mechanical strength; sorptivity

1. Introduction

Millions of scrap vehicle tires are generated in most countries of the world annually. The Rubber Manufacturers Association (RMA, 2014), reported that more than 250 million scrap tires are generated in the United States every year. Reuse of scrap tires as a construction material, especially as a replacement material for finite natural aggregates will engender significant