



[Back](#)

Impacts of Crumb Rubber Surface Treatments on the Strength of Rubberised Mortar

[Lecture Notes in Civil Engineering](#) • Conference Paper • 2025 •

DOI: 10.1007/978-981-96-7814-3_5

[Nazifa Aminuddin, Alia](#); [Wan Hassan, Wan Firdaus](#) ; [Saad, Siti Asmahani](#);

[Md. Husain, Nadiah](#); [Che Deraman, Siti Noratikah](#)

Department of Civil Engineering, Kulliyyah of Engineering, International Islamic University Malaysia, Jalan Gombak, Kuala Lumpur, Malaysia

[Show all information](#)

0

Citations

[Full text](#) [Export](#) [Save to list](#)

[Document](#)

[Impact](#)

[Cited by \(0\)](#)

[References \(12\)](#)

[Similar documents](#)

Abstract

Ever since the first production in 6500 BC, the amount of concrete has been increasing over the years. Though it is one of the viable construction elements, its high consumption of natural resources can lead to resource scarcity, which urgently directs the exploration of the potential alternatives in shifting the concrete to become a more environmentally friendly material. Considering that waste tyre rubber can function as aggregate, the idea of rubber-incorporated concrete seems attractive. However, previous research reported that the mechanical properties of concrete are negatively affected by the poor interaction of rubber particles in the cement matrix. To counteract this issue, various rubber treatment methods, which include mechanical, chemical, thermal, and microwave treatment, have been designed as the groundwork of other scientists to enhance the rubberised concrete properties. This paper focuses on characterising the early strength of rubber-treated cement mortars under three reliable methods: thermal, immersion in alkali

solution, and oxidation-sulfonation process. Another aim of this study is to find the best treatment method for modifying crumb rubber (CR) that is feasible enough to be implemented in the industry from technical, practical, and economical point of view. In achieving the objectives, several testing methods are done to obtain the required data for the analysis: vicat testing, sieve analysis and compressive testing. The results show that thermal treatment is the most favourable treatment because the incorporated rubber mortar can match the strength of the controlled mortar. The mortar samples incorporating thermally treated rubber demonstrated the lowest percentage of compressive strength loss (18%) compared to untreated rubber (44%), rubber treated using alkali immersion (35%) and oxidation-sulfonation (52%). Scanning Electron Microscopy (SEM) images were also presented in this paper, which are necessary in explaining the reasons behind the mortar compressive strength data. Thermally treated rubber exhibited smoother surfaces with reduced porosity, contributing to improved bonding and reduced water penetration in the cement matrix. Though this study highlights the potential of using rubber crumbs as a sustainable alternative to sand in mortar, addressing environmental concerns and promoting circular economy principles, future studies should explore the environmental quality assessment of rubberised concrete and mortar, as well as investigate optimal rubber crumb sizing for improved compatibility with conventional aggregates. © The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd. 2025.

Author keywords

Concrete; Mortars; Rubber surface treatments; Sustainable concrete technology; Tyre rubber waste

Indexed keywords

Engineering controlled terms

Cements; Circular economy; Compressive strength; Concrete aggregates; Economic analysis; Heat treatment; Rubber; Rubber applications; Rubber industry; Rubber testing; Rubberized concrete; Surface treatment; Sustainable development

Engineering uncontrolled terms

Cement matrix; Concrete technology; Crumb rubber; Rubber surface treatment; Rubberized concrete; Sustainable concrete technology; Sustainable concretes; Thermal; Treatment methods; Tyre rubber wastes

Engineering main heading

Mortar

Corresponding authors

Corresponding
author

W.F. Wan Hassan

Affiliation

Department of Civil Engineering, Kuliyah of Engineering, International
Islamic University Malaysia, Jalan Gombak, Kuala Lumpur, Malaysia

Email address

wanfirdaus@iiu.edu.my

© Copyright 2025 Elsevier B.V., All rights reserved.

Abstract

Author keywords

Indexed keywords

Corresponding authors

About Scopus

[What is Scopus](#)

[Content coverage](#)

[Scopus blog](#)

[Scopus API](#)

[Privacy matters](#)

Language

[日本語版を表示する](#)

[查看简体中文版本](#)

[查看繁體中文版本](#)

[Просмотр версии на русском языке](#)

Customer Service

[Help](#)

[Tutorials](#)

[Contact us](#)

ELSEVIER

[Terms and conditions](#) ↗ [Privacy policy](#) ↗ [Cookies settings](#)

All content on this site: Copyright © 2025 [Elsevier B.V.](#) ↗, its licensors, and contributors. All rights are reserved, including those for text and data mining, AI training, and similar technologies. For all open access content, the relevant licensing terms apply.

