



Contents lists available at ScienceDirect

Materials Today: Proceedings

journal homepage: www.elsevier.com/locate/matpr

Assessing the performance of concrete made with recycled latex gloves and silicone catheter using ultrasonic pulse velocity

Mohammad I. Al Biajawi ^{a,c}, Rahimah Embong ^{a,*}, Khairunisa Muthusamy ^a, Norasyikin Ismail ^b, Izwan Johari ^c

^a Faculty of Civil Engineering Technology, Universiti Malaysia Pahang, Persiaran Tun Khalil Yaakob, 26300 Kuantan, Malaysia

^b Faculty of Chemical & Process Engineering Technology, Universiti Malaysia Pahang, Persiaran Tun Khalil Yaakob, 26300 Kuantan, Pahang, Malaysia

^c School of Civil Engineering, Engineering Campus, Universiti Sains Malaysia, 14300 Nibong Tebal, Penang, Malaysia

ARTICLE INFO

Article history:
Available online xxxx

Keywords:
Concrete
Ultrasonic Pulse Velocity
Sustainable Concrete
Replacement Materials
Aggregate

ABSTRACT

Significant advances in concrete technology in modern times have prompted the search for environmentally friendly materials that could improve the properties of concrete. The inclusion of recyclable materials to conventional concrete can help in conserving key resources and produce environmentally friendly concrete. The incorporation of latex gloves and silicone catheter waste in concrete is one of the most important approaches to minimize the environmental problems associated with their disposal. In this study, an experiment was conducted to evaluate the effects of using latex gloves and silicone catheter waste as a substitute for coarse aggregates in concrete mixes. Concrete which was made with latex gloves and silicone catheter waste were subjected to UPV evaluations, i.e., ultrasonic pulse velocity tests at 28 curing days. Compressive strength and workability tests were also performed for reference and compared to the replacement sample. The inclusion of latex gloves and silicone catheter waste in proportions of 2.5%, 5%, 7.5 and 10% decreased the UPV values of the concrete. The results showed that the UPV values of the concrete decreased significantly from excellent to very good to poor for all specimens as the proportion of silicone catheters and latex gloves increased. The results showed that the addition of different proportions of latex gloves and silicone catheters decreased the compressive strength of the concrete by 86% and 59%, respectively, when the proportion of latex gloves and silicone catheters in the concrete mix was replaced by 10%. In addition, the fresh concrete property of concrete containing latex gloves and silicone catheters was decreased by 22% and 53%, respectively, when the proportion of latex gloves and silicone catheters was replaced by 10%. This study helps to raise environmental awareness by improving understanding of the waste generated and the importance of reusing waste as a substitute in concrete mixes.

Copyright © 2023 Elsevier Ltd. All rights reserved.

Selection and peer-review under responsibility of the scientific committee of the Engineering Technology International Conference.

1. Introduction

The construction sector has had a significant impact on socio-economic development, and it is described as the backbone of the country [1]. Concrete has been the upfront building material being used across the world for the construction of infrastructures [2,3]. However, concrete is not an entirely eco-friendly material, as the carbon footprint is associated with concrete due to various activities involved. It has high embodied carbon due to carbon

dioxide (CO₂) emissions during cement production, and transportation, as well as the use of natural resources [4–6]. The increase in demand for building materials has increased over the years due to an increase in construction activities, leading to further CO₂ emissions that resulted in depleting natural resources rapidly [7,8]. Consequently, as the use of concrete increases for various construction applications, the use of coarse particles also increases. In addition, it has been observed that the increasing use of concrete places a heavy burden on the sources of these aggregates and deforms the environment through the excessive consumption of resources [9]. It is known that coarse aggregates make up a significant part of concrete [10] and continue to deplete

* Corresponding author.

E-mail address: rahimahe@ump.edu.my (R. Embong).

<https://doi.org/10.1016/j.matpr.2023.06.317>

2214-7853/Copyright © 2023 Elsevier Ltd. All rights reserved.

Selection and peer-review under responsibility of the scientific committee of the Engineering Technology International Conference.