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Investigation on the Mechanical and Water Absorption Properties of Eco-Friendly Bricks Produced from Waste Polypropylene (PP) Bumper

Huei Ruey Ong[a,*], Wan Mohd Eqhwan Iskandar[a], Mohamad Abid Bin Yunos[a], Muhammad Faiz Mohd Zaki[a], Md. Maksudur Rahman Khan[b], Chi Shein Hong[c], Mohd Syahiful Adlan Maarof[c], Nora Fandy Ismail[d]

[a]Faculty of Engineering & Technology, DRB-HICOM University of Automotive Malaysia, Peramu Jaya Industrial Area, 26607, Pekan, Pahang, Malaysia
[b]Petroleum and Chemical Engineering Programme area, Universiti Technology Brunei, Gadong, Brunei Darussalam
[c]Faculty of Chemical and Process Engineering Technology, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Kuantan, Pahang, Malaysia
[d]HICOM Teck See Manufacturing Sdn. Bhd., Lot 76 & 75A, Jalan Sementa 27/91, Section 27, 40000 Shah Alam, Selangor, Malaysia
roi_rui86@hotmail.com

Plastic waste is a growing environmental concern worldwide, and the development of sustainable solutions to manage plastic waste has become a critical priority. One promising solution is the conversion of plastic waste into useful products, such as bricks. This study investigates the potential use of waste polypropylene (PP) bumper, a common automotive plastic waste, to produce eco-friendly bricks. The waste PP bumper was collected from a local industry and mixed with sand in ratios ranging from 100 % PP to 40% PP. The produced bricks were subjected to compression, flexural, and water absorption tests. Results showed that the addition of sand to the PP waste bumper improved the mechanical and water absorption properties of the bricks. In particular, the plastic bricks with minimal inclusion of 5 % bitumen exhibited the highest compressive strength of 8.532 MPa and flexural strength of 1.287 MPa while maintaining low water absorption of 0.04 %. The results of this study suggest that waste PP bumper can be used as a viable raw material for eco-friendly brick production, and the optimal ratio of PP and sand can be determined based on the desired properties of the bricks. The future application of these eco-friendly bricks can be in construction projects in which able to replace traditional clay bricks and contribute to the reduction of plastic waste in landfills.

1. Introduction

Plastic waste has become a major environmental challenge across the world. The widespread use of plastic in various industries and daily life activities has led to the generation of large volumes of plastic waste, which is not only an eyesore but also poses serious threats to the environment and human health. It is estimated that over 300×10^6 t of plastic waste is generated annually (Rafey and Siddiqui, 2021), with a significant proportion of this waste ending up in landfills, oceans, and other natural environments.

The accumulation of plastic waste in these environments has serious consequences, including the loss of biodiversity, soil and water pollution, and the release of toxic chemicals into the environment. As such, there has been a growing need for sustainable solutions to manage plastic waste and mitigate its negative impact on the environment. One such solution is the conversion of plastic waste into eco-friendly building materials like bricks.

Eco-friendly bricks have been gaining popularity in recent years due to their ability to address two major environmental issues: plastic waste management and sustainable building practices (Haque, 2019). These bricks are produced using a combination of plastic waste and other materials like sand, cement, and clay. The

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