

UNIVERSITI TEKNOLOGI MARA

**EFFECT OF CURING SYSTEMS ON
THE CURE CHARACTERISTICS,
PHYSICAL AND MECHANICAL
PROPERTIES OF RECLAIMED
RUBBERS**

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

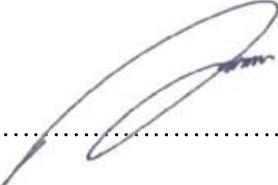
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ABSTRACT

According to Global Waste Consumption 2019, billion tonnes of municipal solid waste produced annually and 33% of that is not managed in an environmentally safe. By 2050, global waste was expected to increase by 19%. Rubber is one of the contributors towards the waste since it is widely used in many applications especially in tire productions. Billions of tires now reside in landfills and illegal dumps around the world, causing pollution from the release of toxic chemicals and the potential for health risks. This research aims to reuse the rubber wastes in the form of reclaimed rubbers which are natural reclaimed rubber (NRR), tyre reclaimed rubber (TRR) and butyl reclaimed rubber (BRR). The effect of three different vulcanization systems, namely sulfur (s), peroxide (p) and mixed sulfur-peroxide (m-s/p) on the rheological, physical, and mechanical properties of the vulcanized reclaimed rubbers is investigated. The effect of TRR ratio in the TRR and natural rubber blend (NR) with sulfur vulcanization system on the cure, physical and mechanical properties is evaluated. This research is divided into two (2) parts. Part A focuses on hundred phr of reclaimed rubber mix with standard compounding ingredients with different vulcanization system. Part B focuses on blending of TRR/NR with different loading of TRR (30/70,50/50,70/30 and 80/20)-. The mixing of reclaimed rubber was carried out by using a two roll mills and internal mixer and all the testing was according to the standard. Different types of vulcanization system influence the cure characteristics of reclaimed rubbers. NRR and TRR vulcanized with sulfur vulcanization system provide shorter cure time than those of peroxide and mixed-sulfur/peroxide vulcanization system. The properties such tensile strength, elongation at break, tensile modulus, and compression set of NRR, TRR and BRR are influenced by different types of vulcanization system. However, the resilience and hardness of these reclaimed rubbers are not affected by different types of vulcanization system. Increasing the TRR ratio in the TRR/NR blend negatively affect the properties. The tensile strength, elongation at break, tear strength and abrasion resistance of TRR/NR blend decrease with the increasing of TRR ratio in the blend. The decreases in the properties of the TRR/NR blends are due to the poor interaction between TRR and NR. The 70/30 TRR/NR blend provides better physical and mechanical properties compared to the other TRR/NR blend.

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