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MECHANICAL AND PHYSICAL PROPERTIES OF UNSATURATED POLYESTER RESINS MODIFIED WITH DEVULCANIZED ETHYLENE POLYPROPYLENE DIENE MONOMER WASTE

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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 Undergraduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

MECHANICAL AND PHYSICAL PROPERTIES OF UNSATURATED POLYESTER RESIN (UPE) MODIFIED WITH DEVULCANIZED ETHYLENE POLYPROPYLENE DIENE MONOMER (EPDM) WASTE BLEND

The mechanical and physical properties of Unsaturated Polyester (UPE) resin modified with devulcanized EPDM (D-EPDM) waste were successfully investigated. D-EPDM waste was blended with UPE at different rubber loading i.e., 0, 10, 20, 30 and 40%. UPE is one of thermoset resin which is lack of toughness due to its high crosslink density that resulting in brittleness of the material. In order to improve its toughness, the introduction of the elastomeric phase was done. However, the usage of rubber may generate more accumulation of waste in landfill. The problem is solved by devulcanized EPDM waste by microwave. The microwave was used in order to break down the cross-linking of EPDM waste. The mechanical and physical testing was carried out. FTIR analysis was analyzed to determine whether physical or chemical interaction involves. FTIR spectra show C=O, C=C and S-O–C bonds are disappeared after devulcanization. A peak at 740 cm^{-1} and 847 cm^{-1} revealed as D-EPDM waste in UPE resin existed. DSC analysis indicates the addition of D-EPDM waste has increased the ΔH. Based on the impact test, the best impact strength is at 40% of D-EPDM waste due to better dispersion of D-EPDM waste particles in UPE matrix and capable to absorb high impact. The hardness of UPE/D-EPDM waste blend decreases gradually as the amount of D-EPDM waste increases. The percentage of water absorption increases as the amount of D-EPDM waste loading increases. However, it decreased at 40% of D-EPDM waste loading. Last but not least, the density results show that the density value increases gradually as the loading of D-EPDM waste increases.