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SURFACE MODIFICATION OF BIOMASS INSERTED ON PLASTIC COMPOSITE BRICK

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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.

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

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ABSTRACT

Microwave absorbing materials play a vital role in reducing electromagnetic interference, ensuring electromagnetic compatibility, and minimizing health hazards associated with radio frequency emissions. The increasing use of telecommunications towers has led to electromagnetic pollution, posing significant risks to human health, including skin burns and eye cataracts. Many buildings are exposed or close to telecommunication towers such as schools, residential areas and others, most of the bricks used for development cannot absorb electromagnetic waves and cause humans to be exposed to electromagnetic pollution. To address these concerns, the development of plastic composite brick absorbers has gained attention for their ability to reduce unwanted electromagnetic radiation. This work revolves around the development of an eco-friendly microwave absorber brick made from polyethylene terephthalate (PET) and palm oil fuel ash (POFA) incorporated plastic composite. PET improves the strength characteristics of the brick, while POFA acts as a partial cement replacement which increases electromagnetic shielding capability. Perforations on the composite's exterior surface were discussed as a way to improve impedance matching conditions and raise the microwave absorption coefficient. Thus, it becomes possible to make different microwave penetration and energy dissipation depth through dielectric loss by varying the depth of slots on the brick surface. The project involves designing and simulating plastic composite brick absorbers using CST Studio Suite software for optimal performance across frequencies from 1 GHz to 12 GHz. Based on the free-space technique, an NRL arch was be used to assess the reflectivity of the prototype developed. Both results of the simulation and free space measurement are analysed and discussed. This study showed the surface modification (SSBD 1 and SSBD 2) had the efficient improvement absorption compared to the commercial and solid brick. The SSBD 2 shows the best absorption reaching -43.41 dB at 8.9 GHz compared to other bricks.

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