

**UNIVERSITI TEKNOLOGI MARA**

**PHYSICAL AND MECHANICAL  
PROPERTIES OF  
HYDROXYAPATITE/  
SILICONE RUBBER COMPOSITES**

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## ABSTRACT

Hydroxyapatite (HA) and Silicone rubber (SR) has been used in this research are two well-known materials in biomedical field. Hydroxyapatite as filler in the rubber composites are varied to various loading of 0 phr to 30 phr. Silicone rubber is the matrix and 2, 5-bis – (t-butylperoxy) 2, 5-dimethylhexane) (DBPMH) as organic curing agent. The materials have been compounded by two roll mills. The rubber compounds have been cured by hot press compression at 200 °C. Then, HA/SR composites has been characterized under cure characteristic, physical testing, mechanical testing, chemical testing and morphology. In cure characteristics, scorch time and cure time are approximately the same without significant difference. But 30 phr of HA shows the highest torque value of 31.55 dNm with more addition of HA. As referred to physical properties, 30 phr of HA shows the highest density and water absorption with 1.17 g/cm<sup>3</sup> and 7.8% respectively. Hardness value of 25 phr of HA is the highest value with 94 IRHD and reduced at 30 phr of HA with 88.2 IRHD. According to mechanical properties, tensile strength value and elongation at break decreased up to 30 phr of HA with 3.15 MPa and 333.25%. Tensile modulus of modulus 100, 300 and 500 are similar in value. In chemical characterization of FTIR, more addition of HA filler into rubber composites are detected by appearance of strong intensity of OH<sup>-</sup> band with broad peak of 30 phr of HA at 3456.99 cm<sup>-1</sup>, meanwhile formation of crosslinks can be found on strong intensity of C-C band at 1637.29 cm<sup>-1</sup> in 30 phr of HA. Lastly, SEM microstructure surface of 30 phr of HA shows most formation of large pores, aggregates and dislocation of HA which the root of low physical and mechanical properties of HA/SR composites. Further research on HA/SR composites with organic coupling agent is essential to enhance crosslinks between hydroxyapatite and silicone rubber. Based on physical and mechanical performance, HA/SR composites may be potential as candidate for human bone tissues in biomedical application.

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