

**FACULTY OF ENGINEERING
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**PREPARATION AND PROPERTIES OF NANOPOROUS
HYDROXIAPATITE CEMENT USING POLYURETHANE**

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**FINAL REPORT
UMS SCHEME RESEARCH GRANTS
NO. SLB0020-TK-2012
FEBRUARY 2013**



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1.0 RESEARCH SYNOPSIS

This research examines optimum sized polyurethane foam (PUF) as a mould for the formation of porous hydroxyapatite, HAp (Calcium Phosphate Cement-base). Four PUFs of different formulations were selected based on their cell size and the percentage of open cell structure. In the preparation of porous HAp, tetracalcium phosphate (TTCP) and dicalcium phosphate anhydrous (DCPA) were mixed at a molar ratio of 1:1 in the presence of a cement setting solution namely, sodium phosphate. The effects of the morphology and the cell size of PUF on HAp morphology were analyzed with a scanning electron microscope (SEM). Based on the analysis, it was observed that only PUFs with an average cell size of approximately 600 μm and with a 95 % open cell structure could optimally generate porous HAp. This porous HAp fulfils the two criteria for an ideal porous implant which include a cell size of more than 100 μm with a high percentage of open cell content (> 50 %) and free from PUF mould residue. However, the porous HAp obtained had a low compressive strength of 0.47 ± 0.056 MPa.

SINOPSIS KAJIAN

Kajian ini dibuat untuk mengkaji busa poliuretana (PUF) bersaiz optimum sebagai acuan bagi pembentukan hydroxyapatite berliang, HAp (Kalsium Fosfat Cement-asas). Empat formulasi yang PUFs berbeza telah dipilih berdasarkan saiz sel dan peratusan struktur sel terbuka. Dalam penyediaan berliang HAp, tetracalcium fosfat (TTCP) dan dikalsium fosfat kontang (DCPA) bercampur-campur pada nisbah molar 1 1 di hadapan penyelesaian penetapan simen iaitu natrium fosfat. Kesan daripada morfologi dan saiz sel PUF pada HAp morfologi dianalisis dengan mikroskop imbasan elektron (SEM). Berdasarkan analisis ini, ia telah diperhatikan bahawa hanya PUFs dengan saiz sel purata kira-kira 600 μm dan dengan struktur sel terbuka 95% secara optimum boleh menjana berliang HAp. HAp berliang memenuhi dua kriteria untuk implan berliang ideal yang termasuk saiz sel lebih daripada 100 μm dengan peratusan yang tinggi kandungan sel terbuka (> 50%) dan bebas daripada sisa acuan PUF. Walau bagaimanapun, Hap berliang diperolehi mempunyai kekuatan mampatan yang rendah iaitu 0.47 ± 0.056 MPa.

