UNIVERSITI TEKNOLOGI MARA

POWDER INJECTION MOULDING OF SYNTHESIZED HYDROXYAPATITE POWDER FROM CLAMSHELL

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Thesis submitted in fulfillment
of the requirements for the degree of
Master of Science

Faculty of Chemical Engineering

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

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ABSTRACT

Hydroxyapatite (HAp) is one of the most versatile bioceramic materials since it is widely used in biomedical and dentistry applications. This research focused on the effect of pH and calcination temperature on synthesized HAp powder from clamshells via chemical precipitation method. Besides that, the process of PIM using synthesized HAp powder mixed with PS based binder system had studied. The effect of sintering temperatures on the as-sintered HAp specimens had evaluated for its physical and mechanical properties. The process to synthesize HAp powder involves calcination of clamshells powder followed by the titration method using low concentration of phosphoric acid. Based on the analysis, synthesized HAp powder at the temperature of 850°C with the final pH solution of 6.5 has similar characterizations with commercial HAp powder. Then, the process is followed by a green processing route via PIM technique to produce the as-sintered HAp specimen. From the results attained, it shows that synthesized HAp feedstock prepared with the powder loading of 60 vol.% shows pseudo-plastic behavior. The feedstock was successfully injection moulded according to ASTM standard C1424-10 to produce green specimens at the temperature of 200°C with the pressure range from 4 to 7 bars. The green specimens were then successfully debound and sintered through single step wick-debinding and sintering process using alumina powder as an embedment agent. The sintered specimens were than evaluated on physical and mechanical properties. From the results obtained, sintering temperature above 1100°C is not preferable since HAp is start to decompose and forming TCP which not suitable for load bearing applications.

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