IN VITRO STUDY OF HYDROXYAPATITE (HAP) SPECIMEN IN THE SIMULATED BODY FLUID (1.5SBF)

AININA BINTI KAMALRULZAMAN

FACULTY OF CHEMICAL ENGINEERING

UNIVERSITI TEKNOLOGI MARA

SHAH ALAM

2017

ACKNOWLEGDEMENT

Alhamdulillah. Thanks to Allah SWT, whom with His willing giving me the opportunity to complete this Final Year Project which is title In Vitro Study Of Hydroxyapatite (HAp) Specimen In The Simulated Body Fluid (1.5SBF). This final year project report was prepared for Faculty of Chemical Engineering, University Teknologi MARA, basically for student in final year to complete the undergraduate program that leads to the degree of Bachelor of Engineering (Hons.) Chemical. This report is based on the guidelines given by the university.

Firstly, I would like to dedicate my sincere gratitude and appreciation to, Dr. Istikamah Binti Subuki, a senior lecturer at Faculty of Chemical Engineering UITM and also assigned, as my supervisor. Thank you for all your guidance, advise, encouragement and also time that you had sacrifice for completing this final year project. I also want to thanks the lecturers and staffs of Faculty of Chemical Engineering UITM for their cooperation during completion of my final year project that had given valuable information, suggestions and guidance in the compilation and preparation this final year project report.

Deepest thanks and appreciation to my parents, family, special mate of mine, and others for their cooperation, encouragement, constructive suggestion and full of support for the report completion, from the beginning till the end. Also thanks to all of my friends and everyone, that have been contributed by supporting my work and help myself during the final year project progress till it is fully completed.

ABSTRACT

This study had been conducted to determine *In-Vitro* properties of hydroxyapatite (HAp) specimen synthesize from the clamshells via precipitation method. HAp specimen were successfully prepared and then immersed in the simulated body fluid (SBF) which has a similar composition to the human blood plasma. 1.5SBF concentration has been chosen as fluid for In-Vitro studies. This research also highlights the purpose of In-Vitro studies of HAp specimen in order to verify the formation of apatite layer on the surface of HAp specimen after its immersion in the simulated body fluid in certain period of time up to 25 days. After immersion, the HAp specimen was then characterized by using Scanning Electro Microscopy (SEM) with Energy Dispersive X-ray Spectroscopy (EDX) and Fourier Transform Infrared Spectroscopy (FTIR). The Fourier Transform Infrared Spectroscopy (FTIR) showed the intensity of functional groups in the HAp such as phosphate, carbonate and OH groups. While, by using Scanning Electro Microscopy (SEM) with Energy Dispersive X-ray Spectroscopy (EDX), the morphology of apatite layer formed in the surface of Hap pellet was analysed and studied. The growth of apatite layers formed in the surface of HAp specimen after immersed in the 1.5SBF was showed as result of study.

TABLE OF CONTENT

CHAPTER 1

INTRODUCTION

1.1 RESEARCH BACKGROUND

Hydroxyapatite has a chemical composition of $Ca_{10}(PO_4)_6(OH)_2$ is a synthetic biomaterial which is having a similarity to the mineral component of natural bones and tissues in mammals and has the hexagonal crystalline structure. HAp has been widely used in orthopaedic, dental, drug delivery application (Alobeedallahah, Ellis, Rohanizadeh, Coster, & Dehghani, 2011). HAp is resembles bone apatite and exhibit good biocompatibility. It is also promotes rapid bone regeneration where the bond generate without the need of intermediate connective tissues and usually applied to reconstruct the hard tissue due to its osteoconductive properties (Akram, Ahmed, Shakir, Ibrahim, & Hussain, 2014). In the recent years, interest in the synthesis of nanosized HAp with grain size less than 100nm has increased because of its high surface activity and enhanced bioresoption (Ramesh, et al., 2015).

Sources of HAp usually from animal cortical bones such as bovine and natural waste such as egg shell, clamshell, fish. There is many ways to synthesize the HAp powder such as sol-gel, spray pyrolysis, combustion, hydrothermal, microwave, precipitation and extraction (Kaygili, et al., 2015). It has their own advantages. However, precipitation method has been widely used to obtain HAp powder because this method has a simple routes and are able to produce high purity HAp as well as its sources from inexpensive natural biological reservoirs. Therefore, in the present research was focused on the synthesis of HAp powder from clamshell natural waste via precipitation method.

In Vitro studies is used as a basis for clinical applications of the HAp biomaterial because HAp composite biomaterial are suit for In Vitro applications. Besides that, the purpose of the In Vitro studies is to verify HAp properties before further experimental is conducted as In Vivo applications are able to be applied for medical purposes. Thus, the HAp powder synthesization via precipitation method from