ADVANCES IN MATERIALS ENGINEERING

Volume 2

Edited By:
Md Abdul Maleque
Iskandar Idris Yaacob
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SELANGOR DARUL EHSAN
TEL: +603-6188 1542 / 44 / 45 FAX: +603-6188 1543
EMAIL: iiumprinting@yahoo.com

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Chapter 023

Production of Porous Calcium Phosphate Ceramics through Polymeric Sponge Method

Asep Sofwan Faturohman Alqap[1], Nur Ain Rakman [2], and Iis Sopyan[1]
[1, 2.] Faculty of Engineering – International Islamic University Malaysia
✉ : sopyan@iium.edu.my, ascpsofwan4@gmail.com

Keywords: Hydroxyapatite, β-Tricalcium Phosphate, Precipitation synthesis, Porous, Sponge method.

Abstract. Combination of hydroxyapatite (HA) and β-tricalcium phosphate (β-TCP), or biphasic calcium phosphate (BCP), is excellent when the combination of structure stability and improved bone remodeling are required as product advantage. Polymeric sponge method was deployed to produce porous calcium phosphate after sintering condition. Powder that produced by precipitation method has showed lasted BCP even after 1250°C sintering. At 1100°C BCP composed of HA as the main phase however beyond of that β-TCP as the main phase.

Introduction

Synthetically produced calcium phosphate (CaP) ceramics have an important position among other biomaterials because they are considered to be almost fully biocompatible with living body when replacing the hard bone tissues. Hydroxyapatite ($Ca_3(PO_4)_6(OH)_2$ (HA)) and tricalcium phosphate ($Ca_3(PO_4)_2$ (TCP)) are recognized as ceramics materials that significantly simulate the mineralogical structure of bone [1]. HA behaves as an inert implant while TCP has been shown to be bioresorbable with new bone growth replacing the implanted TCP. This property imparts significant advantages on the use of TCP compares to other biomedical materials that are not resorbed and replaced by natural bone. As a result, β-TCP has been developed as a biodegradable bone replacement [2]. Bioceramics implant can be applied both in compact and porous forms as well as granules. In the case of porous, a number of *in vivo* studies have demonstrated the occurrence of bone formation in the pores of the calcium phosphate ceramics such as *β*-TCP and HA. However, most of the investigations on the implantation of the porous HA showed that the degree of infiltration of living tissue into the pores and formation of new bone depended greatly on the pore characteristics such as porosity, pore size, pore size distribution and pore shape [3].

The present chapter has focused on the development of tricalcium phosphate porous by polymeric sponge method. Tricalcium phosphates (TCPs) are bone substitute materials that are marked out by their high biocompatibility, favourable resorption properties and osteoconductivity. TCP is characterized by its precisely defined physical and chemo-crystalline properties, high level of uniformity of chemical composition and purity, so that its biological reactions can be predicted reliably. β-TCP is thermodynamically stable in a biological environment and within a normal temperature range. Biodegradation of β-TCP is goof because does not hydrolyse either partially or completely to HA. The resulting crystals, i.e. HA, are not resorbed due to their very low level of solubility and may enter the lymphatic system by phagocytosis. However previous clinical studies with a multiphase, only partially