SYNTHESIS OF BIOCOMPATIBLE CALCIUM PHOSPHATE MATRIX COMPOSITE

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Head

Institute of Research Development and Commercialization (IRDC)

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Dear. Professor,

FINAL RESEARCH REPORT "SYNTHESIS OF BIOCOMPATIBLE CALCIUM PHOSPHATE MATRIX COMPOSITE "

With reference to the above, I am very pleased to submit three copies of the Final Research Report entitled, "Synthesis of Biocompatible Calcium Phosphate Matrix Composite".

Thank you..

Yours Sincerely,

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HAZMAN BIN SELI

The Leader

Research Project

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ABSTRACT

The work investigates the preparation of β-TCP composite reinforced with alumina (Al_2O_3). The β-TCP powder was first prepared via mixing calcium carbonate and phosphoric acid. According to XRD spectrum, the β-TCP phases was obtained after the precursor had been calcined at 850°C for 2 hours. X-Ray diffraction (XRD) analysis, thermal gravimetric analysis (TGA) and energy dispersive X-ray (EDX) analysis of calcined powder were carried out to observe phases changes in producing the β-TCP powder. The obtained powder was mixed with alumina at 4 different portions (1, 3, 5, 10 wt %) for 2 hours. The powder was uniaxially pressed and sintered at 3 different temperatures (950°C, 1050°C, and 1100°C). The presence of phases in the composite was determined by quantitative phase analysis (XRD). Then the determination of physical and hardness properties was carried out i.e. fire shrinkage, bulk density, true porosity and Vickers hardness. The existence of porosity was also observed through SEM technique. The hardness values were very low due to the presence of porosity. The use of alumina as filler for β-TCP matrix to form composite was proven not suitable. The hardness values of the formed composites were low i.e. in the range of 0.2 - 1.6 Gpa. Even though the composites exhibited an incerease in physical properties but they were still not satisfactory.

CHAPTER 1

INRODUCTION

1.1 Introduction

A substance constituting an object able to substitute for an original living part of the body is called a biomaterial. Many human organs consist of calcium phosphate compound for instance tooth and bones. Hydroxyapatite (HA) for example is one of the most attractive calcium phosphates resembling human teeth and bone (Hench, 1991). Maintenance of the organs could be done compatibly by biomaterial devices which can cooperate and make up permanently in the organs. Most calcium phosphates are grouped as resorbable biomaterials. This means that under physiological conditions they will dissolve. The benefit of calcium phosphate biomaterials is that the dissolution products can be readily assimilated by the human body. Due the resorbable nature of calcium phosphate, with the general exception of hydroxyapatite, they have been proposed as potential bone defect fillers. In this application, they would fill the void and gradually dissolve away, being replaced by bone. However, the uncontrollable resorption rate has hindered their uptake in clinical applications. Apart from that, the existence of porosity lowers their strength and this could limit their application in load bearing condition of human bone.