

**ADVANCES
IN MATERIALS
ENGINEERING**

Volume 2

**Edited By:
Md Abdul Maleque
Iskandar Idris Yaacob
Zahurin Halim**



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Table of Content

Chapter 1		Page
Amorphous Coating of Iron Nickel Alloy		1
		Suryanto
Chapter 2		
Characterization of Electroplated Nanocrystalline NiFe Alloy Films		7
	Yusrini Marita and Iskandar I. Yaacob	
Chapter 3		
Corrosion Behavior of Zinc in Potassium Hydroxide Aqueous Solution		13
		Suryanto
Chapter 4		
Development of Carbon Doped TiO ₂ Photocatalyst for Pigment Degradation		19
	Muh Rafiq Mirza Julaihi, Asep Sofwan Faturohman Alqap and Iis Sopyan	
Chapter 5		
Dynamic Mechanical Analysis of Carbon Fibre Composites		25
	Hazleen Anuar, Sahrim Hj. Ahmad and Rozaidi Rasid	
Chapter 6		
Effect of Composition on Phase Transformation of Iron-Platinum Nanoparticles		31
	Koay Mei Hye and Iskandar I. Yaacob	
Chapter 7		
Effect of Nanosized Alumina Reinforcement in Intermetallic Nickel Aluminide on the Formation of γ' Precipitates		37
	Roslina Ismail and Iskandar I. Yaacob	
Chapter 8		
Effect of Sintering Temperature on Protein Foaming-consolidation Porous Alumina-tricalcium Phosphate Composites		43
	Ahmad Fadli and Iis Sopyan	
Chapter 9		
Electrical Property of ITO Thin Film Deposited by Rf Magnetron Sputtering		49
	Agus Geter Edy Sutjipto, Nurul Hajar and Farah Diana	
Chapter 10		
Electrochemical Study of Zinc Selenide Thin Films Prepared for Photovoltaic Applications		55
	Souad. A. Mohamad, A. K. Arof	
Chapter 11		
Electrodeposited CdS / CdTe Solar Cells		61
	Souad. A. Mohamad	
Chapter 12		
Fabrication of Biomass Pellet from Mesocarp Fiber		65
	Zahurin Halim and Nurshazana Mohamad	
Chapter 13		
Fabrication of Kenaf Sandwich Panel		68
	Siti Khadijah Abdul Rahman and Zahurin Halim	

Chapter 14		
Foam Impregnation Method for Artificial Bone Graft Application		78
: Study on the Effect of Drying Time	Fariza Abdul Rahman and Zuraida Ahmad	
Chapter 15		
Foam Impregnation Method for Artificial Bone Graft Application		84
: Study on the Effect of Sintering Temperature	Zuraida Ahmad and Fariza Abdul Rahman	
Chapter 16		
FTIR Analysis - Aluminium Hydroxide Treated with Silane Coupling Agent		89
	Noorasikin Samat, Nor Suhaila Nor Saidi and Muhammad Saffuan Sahat	
Chapter 17		
Inorganic / Organic /Inorganic Double Junction Thin Film Solar Cells		92
	Souad. A. Mohamad	
Chapter 18		
Investigation on The Effect of Ultra Violet on Cotton Albumen Composite		96
	Zahurin Halim , Zuraida Ahmad and Fauziah Md Yusof	
Chapter 19		
Measurement of Oxygen Permeability in Bulk Alloys by Internal Oxidation of Dilute Constituent		100
	Mohd Hanafi Bin Ani and Raihan Othman	
Chapter 20		
Natural Dye Coated Nanocrystalline Tio ₂ Electrode Films for DSSCs		106
	Souad. A. Mohamad and Iraj Alaci	
Chapter 21		
Normal Deposition to Anomalous Deposition		109
	Suryanto	
Chapter 22		
Polymer Clay Nanocomposites: Part II- Synthesis of Polymer Nanocomposites		115
	Noor Azlina Hassan, Norita Hassan	
Chapter 23		
Production of Porous Calcium Phosphate Ceramics through Polymeric Sponge Method		120
	Asep Sofwan Faturohman Alqap, Nur Ain Rakman, and Iis Sopyan	
Chapter 24		
Silicone Doped Calcium Phosphate Powder Synthesized via Hydrothermal Method		126
	Asep Sofwan Faturohman Alqap, Iis Sopyan and Zuria Farhana Kushaili	
Chapter 25		
Stress Analysis of Backend Metallization		132
	Iskandar I. Yaacob and Goh Chia Lan	
Chapter 26		
Study on Metal Removing from Alumina Ceramics		137
	Agus Geter Edy Sutjipto and Muhyiddin Bin Budah@Udah	

Chapter 27		
Surface Quality of <i>Dipterocarpus Spp</i> under Tropical Climate Change: Effect of Pre-Weathering		146
	Mohd Khairun Anwar Uyup, Hamid Hamdan, Paridah Mat Tahir, Hazleen Anuar, Noorasikin Samat, Siti Rafidah Mohamed	
Chapter 28		
Surface Topography of Sulphuric Treated Carbon Fibre		151
	Hazleen Anuar, Sahrim Hj. Ahmad and Rozaidi Rasid	
Chapter 29		
Synthesis and Characterization of Electrodeposited Iron-Platinum Nanostructured Thin Films		157
	Seoh Hian Teh and Iskandar I. Yaacob	
Chapter 30		
Synthesis of Magnetic Nanoparticles in Water-in-Oil Microemulsions		164
	Iskandar I. Yaacob	
Chapter 31		
The Effect of R-ratio on Fatigue Crack Propagation in Plasticised PVC and Modified PVC		170
	Noorasikin Samat, Alan Whittle and Mark Hoffman	
Chapter 32		
The Effect of R-ratio on Fatigue Crack Propagation in Un-plasticized PVC and Modified PVC		175
	Noorasikin Samat, Alan Whittle and Mark Hoffman	
Chapter 33		
Thin Film of Indium Tin Oxide and Its Deposition Technology Deposition		180
	Agus Geter Edy Sutjipto, Sugrib Kumar Shaha	
Chapter 34		
X-ray Photoelectron Studies on the Surface Chemical States of Yttria-Stabilized Zirconia Thin Film in Aqueous Acid Hydrofluoric		186
	Sukreen Hana Herman, Mohd Hanafi Ani, and Susumu Horita	
Chapter 35		
ZnO / Polymer Junction Growth for Hybrid Solar Cell Applications		194
	Souad. A. Mohamad	

Production of Porous Calcium Phosphate Ceramics through Polymeric Sponge Method

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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 ($\text{Ca}_3(\text{PO}_4)_2(\text{OH})_2$ (HA)) and tricalcium phosphate ($\text{Ca}_3(\text{PO}_4)_2$ (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 chemocrystalline 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 good 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