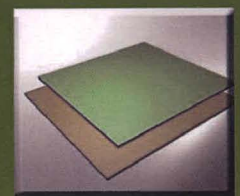


# ADVANCES IN COMPOSITE MATERIALS

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Iskandar Idris Yaacob  
Md Abdul Maleque  
Zahurin Halim



IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

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**Iskandar Idris Yaacob  
Md Abdul Maleque  
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**IIUM Press**

Published by:  
IUM Press  
International Islamic University Malaysia

First Edition, 2011  
©IUM Press, IUM

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Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

Iskandar Idris Yaacob, Md Abdul Maleque & Zahurin Halim: *Advances in Composite Materials*.

ISBN: 978-967-418-231-1

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM  
(Malaysian Scholarly Publishing Council)

Printed by :  
**IUM PRINTING SDN. BHD.**  
No. 1, Jalan Industri Batu Caves 1/3  
Taman Perindustrian Batu Caves  
Batu Caves Centre Point  
68100 Batu Caves  
Selangor Darul Ehsan

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## Synthesis and Characterization of Sol-Gel Method Derived Zinc Doped Hydroxyapatite Powder

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**Keywords:** Hydroxyapatite;  $\beta$ -Tricalcium phosphate; zinc; biphasic calcium phosphate;  $\beta$ -TCP Stabilizer; sol-Gel; synthesis.

**Abstract:** Hydroxyapatite is highly biocompatible non degradable ceramic. Tricalcium phosphate is degradable which is faster for bone remodeling. Zinc as one mineral that presents in small amount in biological body has been successfully incorporated as dope via sol-gel method to produce hydroxyapatite with small amount trace of  $\beta$ -tricalcium phosphate. Increasing in the amount of Zn did not affect much to the amount of the trace but its oxide. 5% mol of Zn is optimal to produce biphasic calcium phosphate without the oxide appearance.

### Introduction

At the dawn of the 21<sup>st</sup> century, biomaterials are widely used throughout medicine, dentistry and biotechnology. Biomaterials, an exciting field with steady, strong growth over its approximately half century of existence, encompass aspects of medicine, biology, chemistry, and materials science. It classified as foundation of engineering principles. There is also a compelling human side to the therapeutic and diagnostic application of biomaterials [1]. The examples of bioceramics are Zirconia ( $ZrO_2$ ), Alumina oxide ( $Al_2O_3$ ), hydroxyapatite (HA) and Tricalcium Phosphate (TCP). The mechanism of tissues attachment is directly related to the type of tissue response at the implant-tissues interface [2]. Among the calcium phosphate based biomaterials, HA is the most stable one in contact with body fluids while TCP is degradable which is faster for bone remodelling. The combination of these different properties is advantageous of biphasic calcium phosphate, BCP [3].

HA ( $Ca_{10}(PO_4)_6(OH)_2$ ), a synthetic material analogous to calcium phosphate found in bone is considered for orthopedic and dental applications. This biomaterial is highly biocompatible and presents bioactive properties. HA physicochemically bonds to bone and promotes bone formation necessary for implant osseointegration. This property of osseointegration is needed to minimize damages to surrounding tissues and to increase the implant efficiency [4].

Biological and physicochemical properties of HA can be improved by the substitution with ions usually present in natural apatites of bone. Most natural apatites are non-stoichiometric because of the presence of minor constituents such as cations ( $Mg^{2+}$ ,  $Mn^{2+}$ ,  $Zn^{2+}$ ,  $Na^+$ ,  $Sr^{2+}$ ) or anions ( $HPO_4^{2-}$ ,  $F^-$ ,  $CO_3^{2-}$ ). Trace ions substituted in apatites can have