SYNTHESIS AND CHARACTERIZATION OF STRONTIUM AND COBALT DOPED AKERMANITE BIOCERAMICS

HOSSEIN MOHAMMADI

UNIVERSITI SAINS MALAYSIA

2019

SYNTHESIS AND CHARACTERIZATION OF STRONTIUM AND COBALT DOPED AKERMANITE BIOSCERAMICS

by

HOSSEIN MOHAMMADI

Thesis submitted in fulfillment of the
requirements for the degree of
Doctor of Philosophy

November 2019

ACKNOWLEDGEMENT

The author wishes to acknowledge with immense gratitude, his supervisor, Prof. Dr. **Ahmad Fauzi Mohd Noor**, for his assistance, continuous support and personal involvements in all the aspects of this PhD research. The author is grateful to his co-supervisors, Dr. Yanny Marliana Baba Ismail and Dr. Khairul Anuar Shariff for their assistance in this PhD research. Working with them was an opportunity for great learning and experience. The author would also like to extend his gratitude to Dean Prof. Dr. Syed Fuad B. Saiyid Hashim and School of Materials and Mineral Resources Engineering (SMMRE). The author would also gratitude all the technical staff of the School of Materials and Mineral Resources Engineering, Univeristi Sains Malaysia, most especially, Encik Mokhtar Bin Mohamad**,** Encik Muhammad Khairi Bin Khalid, Encik Abdul Rashid Bin Selamat and Encik Mohammad Azrul Bin Zainol Abidin for making available the needed facilities in the accomplishment of this research work.

The author would also like to thank specially his parents and for their prayers, guidance, encouragement, and support. To all my friends especially Mona all over the world and in Iran, I say thank you all for being there for me.

Best wishes

Hossein Mohammadi

November 2019

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS

Å	Angstrom
cm	centimeter
°C	Degree Celsius
°K	Kelvin
º/min	Degree/minute
T	Temperature
ΔH	Enthalpy
ΔG	Gibbs Free Energy
θ	Bragg Angle
λ	Wavelength
d	Distance between Planes
l	Diagonal Length
hkl	Miller Indices
d_{hkl}	Interplanar Spacing
kV	Kilovolt
mA	Milliampere
kgf	Kilogram Force

s	Seconds
a	Lattice Parameter a
c	Lattice Parameter c
V	Lattice Volume
β	Diffraction Peak Full Width at Half Maximum Intensity
L	Crystallite Size
Ca	Calcium
P	Phosphorous
k	Scherrer Constant
Sr	Strontium
Co	Cobalt
Mg	Magnesium
Si	Silicon
Au	Gold
KBr	Potassium Bromide
ρ	Density
P_o	Apparent Porosity
ψ	Theoretical Density

V_s	Volume of SBF
g	Gram
h	Hour
D	Diffusion Coefficient
D_0	Constant for Diffusion
t	Thickness
W	Weight
S_a	Surface Area
Z	Number of Molecules Per Unit Cell
M	Molecular Weight
σ	Tensile Strength
HV	Hardness Number
N	Newton
F	Force
mol	Mole
rpm	Rotation Per Minute
<	Less than
m	Meter

mm^2	Millimeter Square
cm^2	Centimeter Square
MPa	Mega Pascal = 1 N/mm^2
GPa	Giga Pascal
K_{Ic}	Fracture Toughness
a_i	Half Diagonal Length
c_i	Radial Crack Dimension
l_i	Indentation Crack Length
ml	millilitre
N_A	Avogadro's number
n	Number of Samples
p	Significance Level
r	radius
h	height
min	Minute
>	More than
M	Molarity
nm	Nanometer