

CONTEMPORARY METALLIC MATERIALS

Md Abdul Maleque
Iskandar Idris Yaacob
Zahurin Halim



IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

CONTEMPORARY METALLIC MATERIALS

Edited by:

Md Abdul Maleque

Iskandar Idris Yaacob

Zahurin Halim



IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011
©IIUM Press, IIUM

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without any prior written permission of the publisher.

Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

ISBN: 978-967-418-164-2

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

Printed by :

IIUM 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

Table of Content

Chapter 1 Upgrading of Laterite Ore by Reduction and Leaching <i>Hadi Purwanto and Pramusanto</i>	1
Chapter 2 Upgrading of Iron Sand by Magnetic Concentration and Reduction <i>Muta'alim, Hadi Purwanto, Nuryadi Saleh and Pramusanto</i>	7
Chapter 3 Microstructure and Mechanical Properties of Neutron Transmutation Doped of Silicon under Cf-252 Neutron Bombardment <i>Agus Geter Edy Sutjipto, Roslan Yahya</i>	16
Chapter 4 Effect of Stabilizer Addition on Crystal Formation of Zirconia Synthesize From Zircon Sand <i>Yuhelda Dahlan Hadi Purwanto, Nuryadi Saleh and Pramusanto</i>	20
Chapter 5 Upgrading of Iron-rich Laterite Ore Using Reverse Flotation <i>Hadi Purwanto, Mutaalim, Yuhelda Dahlan, Nuryadi Saleh and Pramusanto</i>	27
Chapter 6 Influences of Additives on Copper Film Quality and Gap Filling Capability of Plating Process <i>Shahjahan Mridha and Law Shao Beng</i>	34
Chapter 7 Grain Refining in AISI 430 Ferritic Stainless Steel Welds by Addition of Metal Powder <i>Shahjahan Mridha and Muhammed Olawale Hakeem Amuda</i>	41
Chapter 8 Grain Refinement Practices in Ferritic Stainless Steel Welds <i>Muhammed Olawale Hakeem Amuda and Shahjahan Mridha</i>	48
Chapter 9 Alloy Coating on Steel Surfaces by Melt Synthesis of Elemental Metal Powders <i>Shahjahan Mridha</i>	53

Chapter 10	59
Synthesis And Characterization of Lithium Manganese Copper Oxides for use in Lithium Rechargeable Cells	
<i>I.I. Yaacob, N. Kamarulzaman, and W.J. Basirun^f</i>	
Chapter 11	65
Influence of Grain Size on Magnetic Properties of Electroplated NiFe	
<i>Yusrini Marita and Iskandar Idris Yaacob</i>	
Chapter 12	70
Composite Coating on Titanium Alloy Using High Power Laser	
<i>Shahjahan Mridha</i>	
Chapter 13	75
The Tribological Behaviour of Al-Si Automotive Piston Material	
<i>Arifutzzaman and Md Abdul Maleque</i>	
Chapter 14	81
Conceptual Design of Folding Bicycle Frame with Light Weight Materials	
<i>Md Abdul Maleque and Mohd Nizam</i>	
Chapter 15	86
Reverse Engineering of Automotive Piston	
<i>Md Abdul Maleque and A. Arifutzzaman</i>	
Chapter 16	92
Recent Trend in Application of High Temperature Ferritic Fe-Cr Alloys in Power Plant	
<i>Mohd Hanafi Bin Ani and Raihan Othman</i>	
Chapter 17	98
Measurement of Oxygen Permeability in Bulk Alloys by Internal Oxidation of Dilute Constituent	
<i>Mohd Hanafi Bin Ani and Raihan Othman</i>	
Chapter 18	104
Recent Trend on Application of High Temperature Ferritic Fe-Cr Alloys in Solid Oxide Fuel Cells	
<i>Mohd Hanafi Bin Ani and Raihan Othman</i>	
Chapter 19	110
Principle of Solid Electrolyte Oxygen Sensor	
<i>Mohd Hanafi Bin Ani and Raihan Othman</i>	
Chapter 20	116
Surface Oxygen Potential on the Oxide Scale during High Temperature Oxidation of Fe-Cr Alloys at 1073 K	
<i>Mohd Hanafi Bin Ani and Raihan Othman</i>	

	<i>Mohd Hanafi Bin Ani and Raihan Othman</i>	
Chapter 21		121
Reverse Engineering for Automotive Fuel Tank		
	<i>Md Abdul Maleque and Atiqah Afdzaluddin</i>	
Chapter 22		127
The possibility of utilizing scanning electron microscope for materials characterization		
	<i>Agus Geter Edy Sutjipto</i>	
Chapter 23		135
Piezoelectricity of Zinc Oxide Thin film as Source of Energy for Sensor Applications		
	<i>Agus Geter Edy Sutjipto, Liyana Abdul Gafar and Nor Azyati Syazwina Roselan</i>	
Chapter 24		141
Study on Zinc Oxide Crystal Growth		
	<i>Agus Geter Edy Sutjipto, Liyana Abdul Gafar and Nor Azyati Syazwina Roselan</i>	
Chapter 25		147
Green Nanotechnology using SEM and AFM		
	<i>A.G.E. Sutjipto and R. Muhida</i>	
Chapter 26		155
The effect of Cobalt addition on structural and magnetic properties of electrodeposited Iron-Platinum nanocrystalline thin films		
	<i>Seoh Hian Teh¹, Iskandar Idris Yaacob</i>	
Chapter 27		163
Mechanochemical Synthesis of CeO ₂ Nanopowder using Planetary Ball Milling		
	<i>Iskandar I. Yaacob</i>	
Chapter 28		170
A Study on Double Junction Zinc Based/Polymer Thin Film Solar Cell		
	<i>S. A. Mohamad and A. K. Arof</i>	
Chapter 29		176
A Voltammetric Study of Zinc Telluride Thin Films Prepared for Photovoltaic Applications		
	<i>S. A. Mohamad and A. K. Arof</i>	
Chapter 30		181
Electrodeposition Technique for ZnO Semiconductor Thin Films Fabrication		
	<i>S. A. Mohamad</i>	
Chapter 31		186
Electroless Nickel Based Coatings From Solution Containing Sodium Hypophosphite		
	<i>Suryanto</i>	

Chapter 32 Aluminum Spray Coating for Corrosion Resistance of Steel	192
	<i>Suryanto</i>
Chapter 33 Electrodeposition of Alloys	198
	<i>Suryanto</i>
Chapter 34 Corrosion Behavior of Duplex Stainless Steel in Sea Water	204
	<i>Suryanto</i>
Chapter 35 Cathodic Protection of Underground Pipes	210
	<i>Suryanto</i>

A Voltammetric Study of Zinc Telluride Thin Films Prepared for Photovoltaic Applications

S. A. Mohamad¹, A. K. Arof²

¹Faculty of Engineering – International Islamic University Malaysia

²Faculty of Science – university of Malaya

✉ : su3ad@iium.edu.my; abka@um.edu.my

Keywords: ZnTe, Thin films, Voltammetry, Electrodeposition

Abstract: Electrodeposition of ZnTe thin films by controlled potential method from aqueous solutions on ITO were done to investigate characteristics suitable as a window material in solar cells technology. The influence of bath temperature and deposition potential towards the Zn: Te ratio and the crystallinity are discussed.

Introduction

Thin films of wide band gap semiconductors are studied for optoelectronic applications, such as, light emitting diodes or laser diodes. The methods which can be used in the formation of high quality thin films are: chemical vapor deposition, molecular beam epitaxy, pulsed laser, evaporation, and sputtering. Highly efficient films can be also obtained using electrodeposition which can yield materials with suitable band gap for solar cells applications.

Among the wide band-gap semiconductor materials, electrodeposition of zinc thin film compounds from aqueous solutions, have been the subject of numerous studies. Most of the studies deal mainly with ZnSe and, in a lesser extent, with ZnTe. Electrochemical preparation of thin films of ZnTe was first reported by Basol and Kapur [1] using a two stage process involving electrodeposition of Te and Zn stacked layers from aqueous electrolytes followed by annealing.

To understand the electrochemical behavior of the deposited ZnTe films from aqueous solution, a detailed voltammetric study of the precursors and their mixtures were established. Then from this study the deposition potential for the electro-deposition of ZnTe thin films was selected.

Experimental

The chemicals were used without any further purification and prepared at room temperature. Analar grade chemicals were employed; the supporting electrolyte was 0.5 M K₂SO₄ in all cases. A stock solution of TeO₂ in H₂SO₄ was prepared by dissolving 60 mg TeO₂ in 12 M H₂SO₄ by heating and diluting with distilled water and the pH was adjusted to 3.0 by adding diluted H₂SO₄. The effect of various parameters such as deposition potential, bath temperature, pH and concentration on the deposition process were studied.