

# CONTEMPORARY METALLIC MATERIALS

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Md Abdul Maleque  
Iskandar Idris Yaacob  
Zahurin Halim



IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

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Edited by:

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**IIUM Press**

Published by:  
IIUM Press  
International Islamic University Malaysia

First Edition, 2011  
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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

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

<b>Chapter 10</b>	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<sup>f</sup></i>	
<b>Chapter 11</b>	65
Influence of Grain Size on Magnetic Properties of Electroplated NiFe	
<i>Yusrini Marita and Iskandar Idris Yaacob</i>	
<b>Chapter 12</b>	70
Composite Coating on Titanium Alloy Using High Power Laser	
<i>Shahjahan Mridha</i>	
<b>Chapter 13</b>	75
The Tribological Behaviour of Al-Si Automotive Piston Material	
<i>Arifutzzaman and Md Abdul Maleque</i>	
<b>Chapter 14</b>	81
Conceptual Design of Folding Bicycle Frame with Light Weight Materials	
<i>Md Abdul Maleque and Mohd Nizam</i>	
<b>Chapter 15</b>	86
Reverse Engineering of Automotive Piston	
<i>Md Abdul Maleque and A. Arifutzzaman</i>	
<b>Chapter 16</b>	92
Recent Trend in Application of High Temperature Ferritic Fe-Cr Alloys in Power Plant	
<i>Mohd Hanafi Bin Ani and Raihan Othman</i>	
<b>Chapter 17</b>	98
Measurement of Oxygen Permeability in Bulk Alloys by Internal Oxidation of Dilute Constituent	
<i>Mohd Hanafi Bin Ani and Raihan Othman</i>	
<b>Chapter 18</b>	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>	
<b>Chapter 19</b>	110
Principle of Solid Electrolyte Oxygen Sensor	
<i>Mohd Hanafi Bin Ani and Raihan Othman</i>	
<b>Chapter 20</b>	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>	
<b>Chapter 21</b>		121
Reverse Engineering for Automotive Fuel Tank		
	<i>Md Abdul Maleque and Atiqah Afdzaluddin</i>	
<b>Chapter 22</b>		127
The possibility of utilizing scanning electron microscope for materials characterization		
	<i>Agus Geter Edy Sutjipto</i>	
<b>Chapter 23</b>		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>	
<b>Chapter 24</b>		141
Study on Zinc Oxide Crystal Growth		
	<i>Agus Geter Edy Sutjipto, Liyana Abdul Gafar and Nor Azyati Syazwina Roselan</i>	
<b>Chapter 25</b>		147
Green Nanotechnology using SEM and AFM		
	<i>A.G.E. Sutjipto and R. Muhida</i>	
<b>Chapter 26</b>		155
The effect of Cobalt addition on structural and magnetic properties of electrodeposited Iron-Platinum nanocrystalline thin films		
	<i>Seoh Hian Teh<sup>1</sup>, Iskandar Idris Yaacob</i>	
<b>Chapter 27</b>		163
Mechanochemical Synthesis of CeO <sub>2</sub> Nanopowder using Planetary Ball Milling		
	<i>Iskandar I. Yaacob</i>	
<b>Chapter 28</b>		170
A Study on Double Junction Zinc Based/Polymer Thin Film Solar Cell		
	<i>S. A. Mohamad and A. K. Arof</i>	
<b>Chapter 29</b>		176
A Voltammetric Study of Zinc Telluride Thin Films Prepared for Photovoltaic Applications		
	<i>S. A. Mohamad and A. K. Arof</i>	
<b>Chapter 30</b>		181
Electrodeposition Technique for ZnO Semiconductor Thin Films Fabrication		
	<i>S. A. Mohamad</i>	
<b>Chapter 31</b>		186
Electroless Nickel Based Coatings From Solution Containing Sodium Hypophosphite		
	<i>Suryanto</i>	

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

## Upgrading of Laterite Ore by Reduction and Leaching

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**Keywords:** Magnetization, Limonitic ore, Leaching, Nickel, Ironmaking.

**Abstract:** In the viewpoint of environment preservation and efficient utilization of resources, a series process has been developed to utilize limonitic ore. Limonite is mineral content in laterite sediment with low Ni content and nickel laterite mining waste that can be an alternative raw material of iron making due to its high iron content. Upgrading of the ore was started with magnetization using mixed carbon monoxide and carbon dioxide gases at desired temperature then followed by leaching of the magnetized sample in sulphuric acid media. The result indicated that magnetization can speed up the nickel dissolution and obstruct the iron dissolution. The dissolution rate of nickel was very high in the period of less than 5 min for magnetized sample. The nickel dissolution would be higher by prolonging the leaching time. However, leaching time would not increase the dissolution of both nickel and iron in the non-magnetized sample. Accordingly, magnetization of the ore can control the non metallic dissolution in the leaching process such as iron oxide. At the end of the leaching process, there will be iron-rich residue with minimal nickel content and nickel-rich solution.

### Introduction

Laterite ore is one of the mineral resources containing several kinds of metal elements, such as nickel, cobalt and iron. It is widely distributed in the equatorial region, such as India, Philippine and Indonesia, and is mainly used as a nickel resource. However, the utilization is limited to only the high grade nickel content. Over three decades of nickel refining operation, mining has centered predominantly on nickel containing ore to be fed to ferronickel smelter or nickel matte process. As a proven deposit, the top layer of nickel ore with high content of iron, those containing significant limonitic ore have been reviewed its possibility to be utilized in production of iron ore pellet as well as nickel containing pig iron [1,2]. Although the fundamental characteristics of lateritic ore have been reported in several literatures [3,4], further research on the mineralogical characteristics and reduction behavior of the ore is essential for further utilization as iron ore. When the high-grade Fe laterite is used for iron and steel industries, the complicated chemical structure brings about some difficulties. The high amounts of nickel and cobalt contents result in the low quality of the pig iron produced. Therefore, it is necessary to eliminate the nickel to get a useful laterite for iron-making.

Several methods have been reported to extract Ni using leaching by sulphuric acid, hydrochloric leaching or nitric acid, sulphating process, and so on [5-7]. One of the methods commercially applied is the direct pressure leaching using sulphuric acid (Moa Bay method)