

## Index

Title Page .....	i
Certificates .....	ii
Acknowledgments .....	v
List of figures .....	x
List of tables .....	xv
List of abbreviations .....	xvii
Preface .....	xviii

## Table of Contents

<b>1. Introduction</b> .....	3
1.1 Pre – processing of waste aluminium dross: an essential stage for its recycling.....	10
1.2 Pyrometallurgical route for recycling of aluminium dross.....	12
1.3 Hydrometallurgical route for the recycling of aluminium dross.....	22
1.4 Generation of valuable products from aluminium dross.....	32
1.4.1 Refractories.....	32
1.4.2 Composites.....	33
1.4.3 Cement and concrete products.....	34
1.4.4 Aluminium alloys.....	36
1.4.5 Zeolites and other miscellaneous products.....	37
1.5 Environmental impacts of aluminium dross .....	41
1.6 Production of gases using aluminium dross.....	43
1.7 Objectives and scope of present work .....	45
<b>2 Experimental</b> .....	49
2.1 Material procurement and comminution.....	49
2.1.1 Characterization of aluminium dross.....	50
2.2 Synthesis of tamarugite from white aluminium dross powder .....	53
2.3 Synthesis of Tamarugite by organic solvent precipitation.....	55

2.4 Application of tamarugite: Coagulation test.....	57
2.5 Production of potash alum from white aluminium dross powder.....	58
2.6 Generation of hydrogen gas from white aluminium dross powder.....	60
2.7 Production of alumina from residual solid.....	62
2.8 Details of characterization techniques.....	63
2.9 Determination of aluminium present in the solution by complexometric titrations.....	64
<b>3 Tamarugite synthesis from white aluminium dross.....</b>	<b>69</b>
3.1 Introduction to tamarugite.....	69
3.2 Synthesis and characterization of tamarugite.....	70
3.3 Applications of tamarugite: Coagulation.....	79
3.4 Coagulation of colloidal particles: Jar Test.....	81
3.5 Mechanism of coagulation.....	85
3.6 Coagulation test results.....	88
3.7 Conclusion.....	92
<b>4 Tamarugite production using organic solvent precipitation.....</b>	<b>97</b>
4.1 Introduction.....	97
4.2 Synthesis of tamarugite using organic solvent precipitation.....	98
4.3 Characterization of organic solvents precipitated tamarugite.....	102
4.4 Understanding Organic-Solvent Precipitation.....	112
4.5 Coagulation studies for various coagulants.....	114
4.6 Reutilization of ethanol for the precipitation of tamarugite.....	120
4.7 Characterization of tamarugite produced in the recycling of ethanol.....	122
4.8 Conclusions.....	125
<b>5 Potash alum.....</b>	<b>129</b>
5.1 Production of potash alum from aluminium dross.....	129

5.2 Inherent reactions for potash alum production.....	130
5.3 Underlying mass-flow of aluminium during the production of potash alum.....	135
5.4 Characterization of potash alum.....	137
5.5 Conclusions.....	146
<b>6 Hydrogen generation.....</b>	<b>153</b>
6.1 Introduction.....	153
6.2 Generation of hydrogen gas from aluminium dross.....	155
6.3 Conclusions.....	172
<b>7 Conclusions.....</b>	<b>175</b>
<b>8 Scope for future work.....</b>	<b>179</b>
<b>9 References.....</b>	<b>183</b>
<b>10 List of publications.....</b>	<b>195</b>