
CONTENTS

ACKNOWLEDGEMENTS	XI
LIST OF FIGURES.....	XVII
LIST OF TABLES	XXI
CHAPTER 1 INTRODUCTION	1
1.1 Introduction.....	2
1.2 The Major Industrial Solid Waste	2
1.3 Utilization of solid waste beneficial	3
1.4 Statement of the problem	4
1.5 Significance of Scope	5
1.6 Aim and Objective of the present work	6
CHAPTER 2 LITERATURE REVIEW.....	9
2.1 Introduction.....	10
2.2 Blast furnace slag	10
2.2.1 Characteristics of blast furnace slag	10
2.2.2 Research status of comprehensive utilization of blast furnace slag.....	12
2.3 Ferrochrome slag	13
2.3.1 Characterization of ferrochrome slag.....	14
2.3.2 Research status of comprehensive utilization of ferrochrome slag	14
2.4 Red Mud	15
2.4.1 Characterization of red mud.....	17
2.4.2 Research status of comprehensive utilization of red mud	17

2.5 Olivine sand	18
2.5.1 Characterization of Olivine sand	19
2.5.2 Research status of comprehensive utilization of olivine sand	20
2.6 Silica sand	20
2.6.1 Silica sand phase	21
2.6.2 Characterization of silica sand	22
2.6.3 Research status of comprehensive utilization of silica sand	22
2.6.4 Properties of sand mold	24
2.6.5 Advantages of sand-casting process	25
2.7 Summary and Outlook	30
CHAPTER 3_CHARACTERIZATION OF INDUSTRIAL SOLID WASTE AS A MOLD MATERIAL	31
3.1 INTRODUCTION.....	32
3.2 CHARACTERIZATION	32
3.2.1 Chemical analysis	32
3.2.2 Xray- diffraction (XRD)	33
3.2.3 Thermogravimetric analysis (TGA).....	33
3.2.4 Clay and moisture content	33
3.2.5 Sieve analysis.....	34
3.2.6 Flowability behaviour	36
3.3 RESULT AND DISCUSSION	38
3.3.1 Chemical analysis	38
3.3.2 Physical appearance	39
3.3.3 X-Ray Diffraction (XRD)	39
3.3.4 Thermogravimetric analysis (TGA).....	40
3.3.5 Particle Shape and particle size distribution	42
3.3.6 Clay and moisture content	45
3.3.7 pH value	46
3.3.8 Flowability behaviour	46
3.3.9 Relationship between particle shape, particle size distribution, and flow rate	49

3.4 Conclusions.....	50
 CHAPTER 4 FABRICATION OF SAND- SOLID WASTE MOLD USING CO₂ MOLDING PROCESS AND CHARACTERIZATION AS WELL AS COMPARISON OF MOLD PROPERTIES	
51	
4.1 INTRODUCTION	52
4.2 MOLD PREPARATION.....	52
4.2.1 CO ₂ molding process	52
4.2.2 Silica sand- solid waste mold.....	53
4.3 CHARACTERIZATION	55
4.3.1 Mold properties.....	55
4.3.2 Compressive strength.....	55
4.3.3 Shear strength	55
4.3.4 Hardness.....	56
4.3.5 Permeability	56
4.3.6 Compactness	56
4.3.7 Thermal analysis	57
4.4 RESULTS	58
4.4.1 Compressive strength.....	58
4.4.2 Shear strength	61
4.4.3 Hardness.....	64
4.4.4 Permeability	65
4.4.5 Compactness	69
4.4.6 Melting and casting.....	70
4.4.7 Thermal analysis	74
4.5 CONCLUSIONS	77
 CHAPTER 5 MICROSTRUCTURAL, MECHANICAL, AND WEAR BEHAVIOUR OF A 319 ALLOY CAST IN A DIFFERENT MOLD	
79	
5.1 INTRODUCTION	80

5.2 CHARACTERIZATION	80
5.2.1 Microstructural Analysis.....	80
5.2.2 Secondary dendritic arm spacing (SDAS)	81
5.2.3 Density/ Porosity.....	82
5.2.4 Tensile strength.....	82
5.2.5 Hardness.....	83
5.2.6 Wear.....	83
5.3 RESULTS	85
5.3.1 Microstructure.....	85
5.3.2 Tensile properties.....	93
5.3.3 Hardness.....	97
5.3.4 Density and Porosity	98
5.3.5 Wear rate.....	100
5.3.6 Coefficient of friction (COF)	103
5.4 CONCLUSIONS	109
CHAPTER 6 CONCLUSIONS AND FUTURE SCOPE	111
6.1 SOME MAJOR CONCLUSIONS OF THE PRESENT STUDY ARE AS FOLLOWS:.....	112
6.2 FUTURE SCOPE:	113

References

Publications