

CONTENTS

EXECUTIVE SUMMARY	iii
ACKNOWLEDGEMENTS	v
CONTENTS.....	vii
TABLES.....	ix
FIGURES AND SCHEMES.....	x
ABBREVIATIONS.....	xi
1. INTRODUCTION.....	1
1.1. Project aims	3
1.2. Approach used	4
2. MATERIALS AND METHODS.....	6
2.1. Ligand synthesis	6
2.1.1 Preparation of simple salicylaldimine ligands (L6-L9).....	6
2.1.2 Synthesis of siloxane functionalized ligand (L1).....	6
2.1.3 Preparation of dendrimeric ligands.....	6
2.2. Preparation of mononuclear metal complexes, C12-C15.....	7
2.3. Preparation of siloxane complexes, C1-C3.....	7
2.4. Immobilization of metal complexes on amorphous silica and MCM-41.....	7
2.5. Methodology to support metal salts on dendrimers	7
2.6. General procedure for the oxidation of phenol.....	8
2.7. General procedure for the catalytic wet air oxidation of industrial waste waters.....	8
3. RESULTS AND DISCUSSION.....	9
3.1. Preparation and characterization of siloxane functionalized metal complexes	9
3.2. Immobilization of metal complexes on amorphous silica (Davisil 710) and on mesoporous silica (MCM-41).....	11
3.3. Preparation and characterization of dendrimeric ligands	15
3.4. Immobilization of metal salts using dendrimer supports.....	18
3.5. Preparation Of Mononuclear Model Complexes:	20
3.6. Evaluation Of Catalysts In A Model Reaction	23
3.6.1. Catalytic oxidation of phenol using standard catalysts	23
3.6.2. Catalyst selectivity in terms of primary oxidation products	24
3.6.3. Phenol oxidation using dendrimer-immobilized catalysts	26
3.6.4. Effect of pH on the performance of dendrimer based catalysts	27
3.6.5. Catalytic Oxidation of phenol using silica-immobilized catalysts.....	29
3.6.5.1 Effect of pH on the oxidation of phenol.....	30
3.6.5.2 Effect of pH on the phenol conversion.....	30
3.6.5.3 Effect of pH on the selectivity of primary oxidation products	33
3.6.5.4 Catalyst selectivity in terms of secondary oxidation products	33
3.7. Remediation Of Wastewater Samples Using Supported Oxidation Catalysts.	39
3.7.1 COD values of untreated samples	40
3.7.2 COD values of waste water samples after catalytic wet-air oxidation.	40
3.7.2.1 Catalytic wet-air oxidation using a single dose of co-oxidant	41
3.7.2.2 Catalytic wet-air oxidation adding co-oxidant in 3 equal doses	42
3.7.2.3 Effect of time on the catalytic wet-air oxidation reaction.	42

4. CONCLUSIONS.....	43
5. RECOMMENDATIONS.....	44
5.1. Potential applications for industry.....	44
5.2. Future research.....	44
6. REFERENCES.....	45
ANNEXURE A: CATALYTIC WET OXIDATION: A REVIEW.....	47
SUMMARY	47
1. INTRODUCTION.....	48
2. CATALYSTS	48
2.1 Heterogeneous Catalysts For Catalytic Wet Oxidation	49
2.1.1 Noble Metal Catalysts	49
2.1.2 Metal Oxide Catalysts	49
2.1.3 Deactivation of Heterogeneous Catalysts.	50
2.1.4 Catalyst Supports	51
2.2 Homogeneous Catalysts For The Oxidation Of Organic Pollutants.....	53
2.2.1 Transition Metal Salts As Homogeneous Oxidation Catalysts.....	53
2.2.2 Transition Metal Complexes as Homogeneous Oxidation Catalysts.....	54
3 ABATEMENT OF POLLUTANTS IN WASTEWATER	56
3.1 Organic Pollutants.....	57
3.1.1 Phenol and Other Aromatic Compounds.	57
3.1.2 Aliphatic Compounds and Carboxylic Acids	62
3.2 Inorganic Pollutants.....	62
3.2.1 Ammonia.....	62
3.2.2 Sulphur Species.....	63
4. CONCLUSION	64
REFERENCES	66
APPENDIX.....	71