Table of contents

1	Introduction	1
1.1	Fundamentals of corrosion	2
1.2	Forms of corrosion	6
1.3	Corrosion control techniques	10
1.4	Electrodeposition of alloys	15
1.4.1	Zinc alloy plating-an overview	16
1.4.2	Anomalous codeposition of Zinc alloys	19
1.4.3	Zinc-Nickel and Zinc-Cobalt alloys	22
1.4.4	Mixed oxide coating by spray pyrolysis technique	24
2	Experimental Techniques	28
2.1	Substrate cleaning	30
2.1.1	Zinc-Nickel codeposition	30
2.1.2	Zinc-Cobalt Deposition	35
2.2	Spray pyrolysis	35
2.2.1	Experimental setup	39
2.3	Analytical Tools	42
2.3.1	X-ray Diffraction	42
2.3.2	Scanning Electron Microscope (SEM)	44
2.3.3	Energy Dispersive X-ray Analysis	48
2.3.4	Scanning tunneling microscopy (STM)-Atomic Force Microscopy (AFM) principles.	50
2.3.5	Electrochemical impedance	56
2.3.6	Open Circuit Potential Measurement	65
3	Electrodeposition of Zinc Nickel Alloy	67
3.1	X-ray analysis	68
3.2	EDAX ANALYSIS	78

3.3	SEM Analysis	81
3.4	AFM results	84
3.5	Open circuit potential measurement	85
4	Zinc Cobalt co-deposition	118
4.1	X-ray analysis	118
4.2	EDAX results	131
4.3	SEM analysis	143
4.4	AFM analysis	151
4.5	Open circuit potential measurement	164
5	Mixed oxide deposition by spray pyrolysis	170
5.1	XRD Analysis	170
5.2	EDAX analysis	184
5.3	SEM micrograph analysis	187
5.4	IMPEDANCE ANALYSIS	192
6	Summary and Conclusion	200
6.1	Zinc-Nickel deposition	201
6.2	Zinc-Cobalt	202
6.3	Mixed oxide coating	204
	Reference	205
	Appendix	211