TABLE OF CONTENTS

Chapter 1: Introduction	1
1.1 Context	1
1.2 Aim and strategy of the research	5
Chapter 2: Literature overview	9
2.1 MOFs structures	9
2.2 Synthesis of MOFs	14
2.3 Applications of MOFs	33
2.3.1 Gas storage, separation and purification	33
2.3.2 Catalysis	38
2.3.3 Electrochemistry	39
2.3.4 Adsorption of dyes	40
2.4 Materials based on Cu and dicyanamide	42
Chapter 3: Experimental	49
3.1 Chemicals	49
3.2 Instrumentation and methodology	50
3.2.1 Electrochemical methods	50
3.2.2 X-ray diffraction method	51
3.2.3 Fourier Transform Infrared Spectroscopy (FTIR)	52
3.2.4 Scanning electron microscope (SEM)	53
3.2.5 Specific surface area (BET method)	53
3.2.6 Thermal gravimetric analysis (TGA)	55
3.2.7 Surface profilometry	55
3.2.8 Dye adsorption measurements	56
3.2.9 Gas adsorption measurements	56
Chapter 4: Results and discussion	61
Synthesis and characterization of Cu-based materials	(1
4.1 Synthesis of copper benzene tricarboxylate	61
4.1.1 Potentiodynamic synthesis	62
4.1.2 Galvanostatic synthesis	66
4.1.2.1 Influence of the electrolyte concentration	69
4.1.2.2 Influence of the synthesis time	/1
4.1.2.3 Influence of hydration	15
4.1.5 Potentiostatic synthesis	/6
4.1.4 Specific surface area and adsorption measurements	80
4.1.4.1 Specific surface area of potentiostatically electrosynthesized material	80

4.1.4.2 Adsorption of dyes	82
4.1.4.3 Gas adsorption	84
4.2 Synthesis and characterization of copper dicyanamide	88
4.2.1 Procedure	88
4.2.2 Voltammetric behaviour of copper ions in presence of dicyanamide anions	90
4.2.3 Electrosynthesis of Cu(I)-dca by reduction of Cu(II)	94
4.2.4 Characterization of the Cu(I)-dca films formed by reduction of Cu(II)	96
4.2.5 Electrosynthesis of Cu-dca compounds by oxidation of Cu(0)	101
4.2.6 Specific surface area and adsorption measurements	110
4.2.6.1 Specific surface area of electrosynthesized material	111
4.2.6.2 Adsorption of dyes	112
4.2.6.3 Gas adsorption	114
4.3 Synthesis and characterization of materials formed at a Cu electrode in presence of H ₃ BTC and Nadca	115
4.3.1. Procedure	115
4.3.2. Cyclic voltammetry	115
4.3.3. Chronoamperometry	119
4.3.4. Characterization of the electrosynthesized materials	122
4.3.5. Influence of the time of electrolysis	126
4.3.6. Influence of the Nadca concentration	131
4.3.7. Additional data on the composition of the material synthesized in presence of Nadca	133
4.3.8. Specific surface area of the electrosynthesized materials	137
4.3.9. Adsorption of dyes	140
4.3.10. Adsorption of gases	143
Chapter 5: General discussion and conclusions	145
References	151
List of abbreviations and acronyms	160
Supporting information	163