

Table of Contents

1	Introduction	11
1.1	Objective and Research Strategy	13
2	Literature	15
2.1	Gas Diffusion Electrodes	15
2.1.1	Applications	15
2.1.2	Working Principle	21
2.1.3	Hydrophobicity	32
2.1.4	Bifunctionality	37
2.1.5	Durability	41
2.2	Electrochemical Reactions in the Gas Diffusion Electrode	45
2.2.1	Alkaline Oxygen Evolution and Reduction Reaction	45
2.2.2	Carbon Corrosion	49
2.3	Electrochemical Deposition of MnO_x on a Metal Substrate	52
3	Experimental	54
3.1	Material List	54
3.2	Sample Preparation	54
3.3	Characterization	58
3.3.1	Material Characterization Methods	58
3.3.2	Electrochemical Characterization Methods	60
4	Results and Discussion	67
4.1	Determination of the Electrodeposition Settings	67
4.1.1	Material Characterization	67
4.1.2	Electrochemical Characterization	73
4.1.3	Interim Conclusion I	84
4.2	Different Metal Substrates and their Coatings	85
4.2.1	Surface Differences	85
4.2.2	Hydrophobic Treatment	92
4.2.3	Electrochemical Characterization	95
4.2.4	Interim Conclusion II	109
4.3	Design of Different Porosity Gradients in CF-GDEs	111
4.3.1	Electrochemical Results of Layered CF-GDEs	112
4.3.2	Interim Conclusion III	126
4.3.3	Benchmarking of state-of-the-art GDEs	128
5	Conclusion and outlook	131
5.1	Conclusion	131
5.2	Outlook	134
6	Summary in German	136

7	Literature	140
8	Table Directory.....	150
9	List of Figures.....	151
10	Appendix	157
11	Hypothesis	174
12	Declaration of Authorship / Selbstständigkeitserklärung	175