

Table of Contents	
Acknowledgement	v
Abstract	vii
Deutsche Kurzfassung	ix
Erklärung zur Dissertation	xi
Table of Contents	xiv
1 Introduction	1
1.1 Catalysis	1
1.1.1 Characterization of Heterogeneous Catalysts	3
1.2 Atomic Layer Deposition	5
1.2.1 Principles of ALD	6
1.2.2 ALD on Powders	11
1.2.3 ALD for Catalysis	14
1.3 References	15
2 Objective and Outline	27
3 Investigating the Trimethylaluminium/Water ALD Process on Mesoporous Silica by In Situ Gravimetric Monitoring	29
3.1 Abstract	29
3.2 Introduction	30
3.3 Experimental Section	31
3.4 Results and Discussion	33
3.4.1 Influence of cycle number	34
3.4.2 Influence of Substrate Temperature	39
3.4.3 Scale Up in Fixed Bed	42
3.5 Conclusions	43
4 Atomic Layer Deposition of ZnO on Mesoporous Silica: Insights into Growth Behavior of ZnO via In-Situ Thermogravimetric Analysis	48
4.1 Abstract	49
4.2 Introduction	49
4.3 Materials and Methods	51
4.4 Results	52
4.4.1 In-situ thermogravimetry	52

4.4.2 Scale-up of the ALD process in a fixed bed reactor	55
4.4.3 Characterization of ALD coated ZnO/SiO ₂ samples	57
4.5 Conclusions	61
5 Mechanistic Studies of Atomic Layer Deposition on Oxidation Catalysts – AlO _x and PO _x Deposition	64
5.1 Abstract	64
5.2 Introduction	65
5.3 Experimental	66
5.4 Characterization	67
5.5 Results and discussion	68
5.5.1 ALD of PO _x on V ₂ O ₅	68
5.5.2 ALD – Investigations on Mechanism	72
5.5.3 ALD of AlO _x on V ₂ O ₅	74
5.6 Conclusions	79
6 Unraveling Property-Performance Relationships by Surface Tailoring of Oxidation Catalysts via ALD	92
6.1 Abstract	92
6.2 Introduction	92
6.3 Results and Discussion	94
6.4 Conclusion	104
6.5 Experimental Section	104
6.6 Supporting Information	110
7 Toolbox for ALD process development on high surface area powders	119
7.1 Abstract	119
7.2 Introduction	119
7.3 Setup Design	121
7.3.1 Vapor pressure determination	121
7.3.2 Parallel Deposition Setup	123
7.4 Experimental	124
7.5 Results and Discussion	126
7.6 Summary and Conclusions	131
8 Summary and Final Conclusions	137

