

Contents

1	Introduction	1
	References.	3
2	Characterization and Modeling of Lithium Dendrite Growth	5
2.1	Characterization of Lithium Dendrite Growth.	5
2.1.1	Characterization of Surface Morphologies	6
2.1.2	Characterization Methods for Surface Chemistry.	16
2.1.3	Other Characterization Techniques	18
2.2	Effect of SEI Layer on Lithium Dendrite Growth.	21
2.2.1	“Dead” Lithium.	25
2.2.2	Interphasial Layer and Formation of Mossy Lithium.	27
2.3	Modeling of Lithium Dendrite Growth.	29
2.3.1	General Models	31
2.3.2	Effect of Current Density.	34
2.3.3	Importance of Interfacial Elastic Strength	36
	References.	36
3	High Coulombic Efficiency of Lithium Plating/Stripping and Lithium Dendrite Prevention	45
3.1	Coulombic Efficiency of Lithium Plating/Stripping.	45
3.2	Electrolyte and In Situ Formed Solid Electrolyte Interphase.	47
3.2.1	Influence of Solvents.	49
3.2.2	Influence of Lithium Salts	61
3.2.3	Influence of Additives	67
3.2.4	Influence of Ionic Liquids	72
3.2.5	Importance of Electrolyte Concentration	75
3.2.6	Self-healing Electrostatic Shield Mechanism	79
3.3	Ex Situ Formed Surface Coating	83
3.4	Mechanical Blocking and Solid Electrolytes.	86
3.4.1	Solid Polymer Electrolytes	86
3.4.2	Solid Inorganic Electrolytes.	91

3.5	Effect of Substrates	96
3.5.1	Alloys	97
3.5.2	Surface Layers and Underpotential Deposition/ Stripping	100
3.5.3	Surface Roughness	103
3.6	Influence of Charge/Discharge Profiles	105
3.6.1	Influence of Pulsed Plating	105
3.6.2	Influence of Plated Charge	106
3.6.3	Influence of Plating (Charge) Current Density	107
3.6.4	Influence of Stripping (Discharge) Current Density	114
3.7	Effect of Rest/Storage Time	116
3.8	Effect of Temperature	118
3.9	Effect of Stack Pressure	123
3.10	Summary	126
	References	127
4	Application of Lithium Metal Anodes	153
4.1	Lithium Metal Batteries with Lithium Intercalation Cathodes	153
4.2	Lithium Metal Anodes in Lithium–Sulfur Batteries	156
4.2.1	Performance and Characteristics of Lithium–Sulfur Batteries	157
4.2.2	High Coulombic Efficiency and Dendrite Prevention	163
4.3	Lithium Metal Anodes in Lithium–Air Batteries	172
4.3.1	Li–Air Batteries Using Protected Lithium Electrodes	175
4.3.2	Lithium–Air Batteries Using Solid Electrolytes	175
4.4	Anode-Free Lithium Batteries	177
	References	179
5	Perspectives	189
	References	192
	Index	193

Lithium Metal Anodes and Rechargeable Lithium Metal
Batteries

Zhang, J.-G.; Xu, W.; Henderson, W.A.

2017, XV, 194 p. 94 illus., 39 illus. in color., Hardcover

ISBN: 978-3-319-44053-8