Masaki Yoshio • Ralph J. Brodd • Akiya Kozawa Editors

Lithium-Ion Batteries

Science and Technologies



Contents

Contributors		xiii
Introduction		
1	Synopsis of the Lithium-Ion Battery Markets Ralph J. Brodd	1
2	A Review of Positive Electrode Materials for Lithium-Ion Batteries Masaki Yoshio and Hideyuki Noguchi	9
3	Carbon Anode Materials Zempachi Ogumi and Hongyu Wang	49
4	Role Assigned Electrolytes: Additives Makoto Ue	75
5	Carbon-Conductive Additives for Lithium-Ion Batteries Michael E. Spahr	117
6	Applications of PVdF-Related Materials for Lithium-Ion Batteries Aisaku Nagai	155
7	SBR Binder (for Negative Electrode) and ACM Binder (for Positive Electrode) Haruhisa Yamamoto and Hidekazu Mori	163
8	Production Processes for Fabrication of Lithium-Ion Batteries Kazuo Tagawa and Ralph J. Brodd	181
9	Polyanionic Cathode-Active Materials Shigeto Okada and Jun-ichi Yamaki	195

e.

10	Overcharge Behavior of MetalOxide- Coated Cathode Materials Jaephil Cho, Byungwoo Park, and Yang-kook Sun	207
11	Development of Metal Alloy Anodes Nikolay Dimov	241
12	HEV Application Tatsuo Horiba	267
13	Flame-Retardant Additives for Lithium-Ion Batteries Masashi Otsuki and Takao Ogino	275
14	High-Energy Capacitor Based on Graphite Cathode and Activated Carbon Anode Masaki Yoshio, Hitoshi Nakamura, and Hongyu Wang	291
15	Development of LiCoO₂ Used for Rechargeable Lithium-Ion Battery Hidekazu Awano	299
16	Cathode Materials: LiNiO₂ and Related Compounds Kazuhiko Kikuya, Masami Ueda, and Hiroshi Yamamoto	315
17	Manganese-Containing Cathode Active Materials for Lithium-Ion Batteries Koichi Numata	323
18	Trends in Carbon Material as an Anode in Lithium-Ion Battery Tatsuya Nishida	329
19	Functional Electrolytes Specially Designed for Lithium-Ion Batteries Hideya Yoshitake	343
20	Lithium-Ion Battery Separators Zhengming (John) Zhang and Premanand Ramadass	367
21	Polymer Electrolyte and Polymer Battery Toshiyuki Osawa and Michiyuki Kono	413
22	A Novel Hard-Carbon Optimized to Large Size Lithium-Ion Secondary Batteries Aisaku Nagai, Kazuhiko Shimizu, Mariko Maeda, and Kazuma Gotoh	427

23	LiMn,O ₄ as a Large Capacity Positive Material	
	for Lithium-Ion Batteries	435
	Masaki Okada and Masaki Yoshio	
Ind	lex	445