

1. Record Nr.	UNINA9910830612003321
Titolo	High energy density lithium batteries [[electronic resource]] : materials, engineering, applications // edited by Katerina E. Aifantis, Stephen A. Hackney, and R. Vasant Kumar
Pubbl/distr/stampa	Weimheim, : Wiley-VCH, 2010
ISBN	3-527-63001-5 1-282-68631-3 9786612686313 3-527-63002-3
Descrizione fisica	1 online resource (283 p.)
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Disciplina	621.312423
Soggetti	Lithium cells
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	High Energy Density Lithium Batteries; Contents; Preface; List of Contributors; 1: Introduction to Electrochemical Cells; 1.1 What are Batteries?; 1.2 Quantities Characterizing Batteries; 1.2.1 Voltage; 1.2.2 Electrode Kinetics (Polarization and Cell Impedance); 1.2.2.1 Electrical Double Layer; 1.2.2.2 Rate of Reaction; 1.2.2.3 Electrodes Away from Equilibrium; 1.2.2.4 The Tafel Equation; 1.2.2.5 Example: Plotting a Tafel Curve for a Copper Electrode; 1.2.2.6 Other Limiting Factors; 1.2.2.7 Tafel Curves for a Battery; 1.2.3 Capacity; 1.2.4 Shelf-Life; 1.2.5 Discharge Curve/Cycle Life 1.2.6 Energy Density1.2.7 Specific Energy Density; 1.2.8 Power Density; 1.2.9 Service Life/Temperature Dependence; 1.3 Primary and Secondary Batteries; 1.4 Battery Market; 1.5 Recycling and Safety Issues; References; 2: Primary Batteries; 2.1 Introduction; 2.2 The Early Batteries; 2.3 The Zinc/Carbon Cell; 2.3.1 The Leclanche Cell; 2.3.2 The Gassner Cell; 2.3.3 Current Zinc/Carbon Cell; 2.3.3.1 Electrochemical Reactions; 2.3.3.2 Components; 2.3.4 Disadvantages; 2.4 Alkaline Batteries; 2.4.1 Electrochemical Reactions; 2.4.2 Components; 2.4.3

Disadvantages; 2.5 Button Batteries
2.5.1 Mercury Oxide Battery 2.5.2 Zn/Ag₂O Battery; 2.5.3 Metal-Air Batteries; 2.5.3.1 Zn/Air Battery; 2.5.3.2 Aluminum/Air Batteries; 2.6 Li Primary Batteries; 2.6.1 Lithium/Thionyl Chloride Batteries; 2.6.2 Lithium/Sulfur Dioxide Cells; 2.7 Oxide Batteries; 2.8 Damage in Primary Batteries; 2.9 Conclusions; References; 3: A Review of Materials and Chemistry for Secondary Batteries; 3.1 The Lead-Acid Battery; 3.1.1 Electrochemical Reactions; 3.1.2 Components; 3.1.3 New Components; 3.2 The Nickel-Cadmium Battery; 3.2.1 Electrochemical Reactions; 3.3 Nickel-Metal Hydride (Ni-MH) Batteries
3.4 Secondary Alkaline Batteries 3.4.1 Components; 3.5 Secondary Lithium Batteries; 3.5.1 Lithium-Ion Batteries; 3.5.2 Li-Polymer Batteries; 3.5.3 Evaluation of Li Battery Materials and Chemistry; 3.6 Lithium-Sulfur Batteries; 3.7 Conclusions; References; 4: Current and Potential Applications of Secondary Li Batteries; 4.1 Portable Electronic Devices; 4.2 Hybrid and Electric Vehicles; 4.3 Medical Applications; 4.3.1 Heart Pacemakers; 4.3.2 Neurological Pacemakers; 4.4 Application of Secondary Li Ion Battery Systems in Vehicle Technology; 4.4.1 Parallel Connection; 4.4.2 Series Connections
4.4.3 Limitations and Safety Issues References; 5: Li-Ion Cathodes: Materials Engineering Through Chemistry; 5.1 Energy Density and Thermodynamics; 5.2 Materials Chemistry and Engineering of Voltage Plateau; 5.3 Multitransition Metal Oxide Engineering for Capacity and Stability; 5.4 Conclusion; References; 6: Next-Generation Anodes for Secondary Li-Ion Batteries; 6.1 Introduction; 6.2 Chemical Attack by the Electrolyte; 6.3 Mechanical Instabilities during Electrochemical Cycling; 6.4 Nanostructured Anodes; 6.5 Thin Film Anodes; 6.5.1 Sn-Based Thin Film Anodes; 6.5.2 Si-Based Thin Film Anodes
6.6 Nanofiber/Nanotube/Nanowire Anodes

Sommario/riassunto

Materials Engineering for High Density Energy Storage provides first-hand knowledge about the design of safe and powerful batteries and the methods and approaches for enhancing the performance of next-generation batteries. The book explores how the innovative approaches currently employed, including thin films, nanoparticles and nanocomposites, are paving new ways to performance improvement. The topic's tremendous application potential will appeal to a broad audience, including materials scientists, physicists, electrochemists, libraries, and graduate students.
