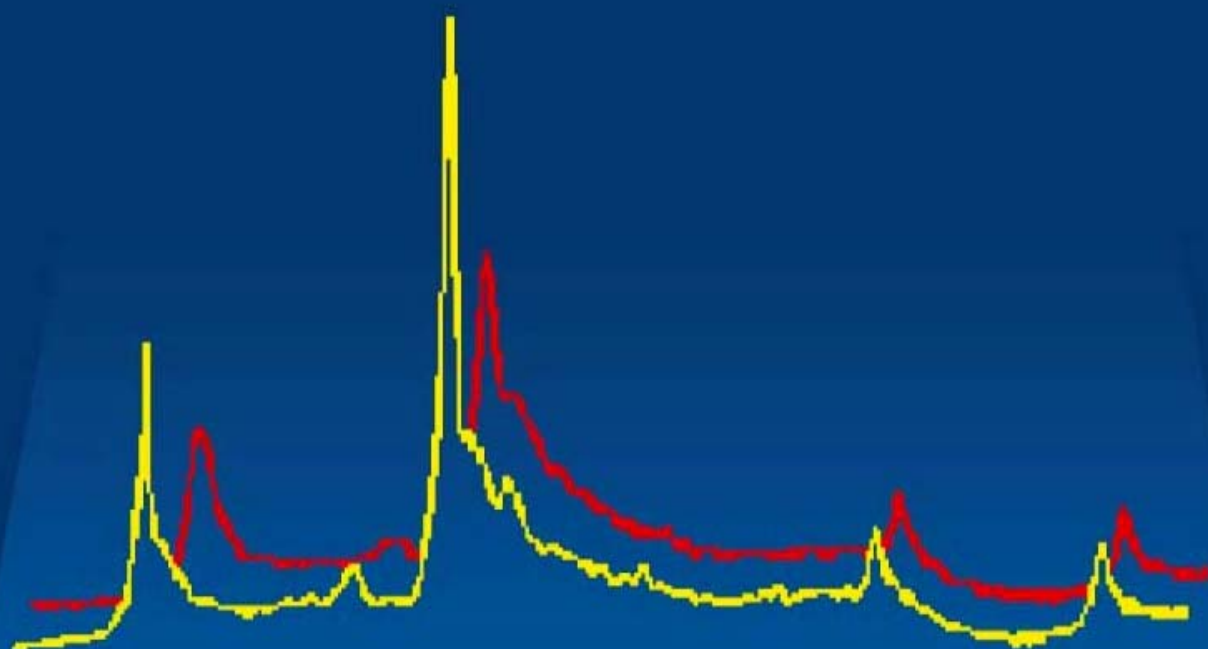


Portable and Emergency Energy Sources

Edited by Z. STOYNOV and D. VLADIKOVA



Prof. Marin Drinov Academic Publishing House

Portable and Emergency Energy Sources

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Preface

The present book is a collection of selected papers related to the vast field of Portable and the Emergency Energy Sources. It was conceived to bring together the knowledge acquired through the project **Portable and Emergency Energy Sources POEMES** (2003 – 2006) supported by the European Commission. However, the book has been subsequently enriched with additional relevant topics of increased importance.

The book is divided into six parts:

- Li-Ion Batteries;
- Metal Hydride Batteries and Hydrogen Storage;
- Solid State Batteries;
- Metal-Air Batteries;
- Solid Oxide Fuel Cells (SOFC);
- Energy Sources Testing and Investigation.

A substantial amount of the articles is devoted to the Li-ion system, where in principle the research and development, as well as the publication activities, are intensive. This part of the book combines both reviews of the state of the art and own results. They are focussed on: (i) improved electrode materials (including replacement of LiCoO_2 as positive electrode material, and development of the solid electrolyte interphase concept) and (ii) their analysis, characterization, and structural determination with new and advanced techniques.

The development and improvements of metal hydrides is discussed in two application aspects: as electrodes in batteries and as active materials for hydrogen storage. The latter constitutes a niche related with the increasing importance of hydrogen energy.

The two articles included in the Solid State Batteries part combine information about the present state of the market with research results on perspective materials, comprising the concept of micro-batteries based on all solid cells.

The group of the metal-air batteries for portable and emergency applications is represented by the high power Zn-air and Mg-air primary and mechanically rechargeable batteries. An original technology for production of air gas-diffusion electrodes, which provide low polarization and stable long-term operation, is developed.

The SOFCs part focuses on effective and innovative approaches towards low temperature operation with reduced costs and improved performance.

The last part, which consists of four papers, is devoted to the techniques for battery measurement, testing, and control. Since the very first measurement of small battery impedance we succeeded to perform thirty years ago in collaboration with H. Takenouti and M. Keddami, battery impedance spectroscopy has found a large variety of applications. The challenge has led us to solutions of many problems related to the low impedance, non-stationary and fuzzy nature of batteries. Part of these new techniques is elucidated in the first two papers of this group. The third paper describes a new generic born technique based on a sweep coulometry and producing valuable and informative spectra.

The last paper of the book summarizes the electrochemical instrumentation state of the art. It also gives an introduction to the concept of the Smart Battery – the most advanced approach to integration of batteries into energy systems.

The present book does not assume to cover the full spectrum of problems, achievements, and trends in the field of portable and emergency energy sources. We hope, however, that it will be of interest and of use to those involved in the research and development of energy sources.

It is our pleasure to acknowledge with gratitude the financial support by the European Commission under contract NNE5/2002/18 “Portable and Emergency Energy Sources - POEMES”, that made possible the edition and the distribution of the book.

We would also like to acknowledge the NATO Programme Science for Peace for the support of two Advanced Study Institutes: “Materials for Li-ion Batteries”, and “New Trends in Intercalation Compounds for Energy Storage“, organized in Sozopol, Bulgaria in collaboration with Prof. C. Jullien, Prof. J.P. Perreira-Ramos and Prof. A. Momchilov. They

provided a fertile scientific atmosphere and ensured professional contacts, which promoted the initial idea for the organization of this book.

We wish to thank the Bulgarian Academy of Sciences and Prof. Marin Drinov Academic Publishing House for their financial and organizational support.

We would also like to express our gratitude to:

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2006

Zdravko Stoynov

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CONTENTS

Preface

v

LI-ION BATTERIES

The Layered $\text{LiNi}_{0.5}\text{Mn}_{0.5}\text{O}_2$ Positive Electrode Material for Li-ion Battery

Asharaf Abdel-Ghany, Karim Zaghib, Christian M. Julien

1

1. Introduction	1
2. Structural Considerations	3
3. Synthesis of $\text{LiNi}_{0.5}\text{Mn}_{0.5}\text{O}_2$ Oxides	7
4. Electronic Properties	11
5. Lattice Dynamics	18
6. Electrochemical Properties	24
7. Concluding Remarks	31
References	33

Structure of Electrode Materials for Li-ion Batteries: the Raman Spectroscopy Investigations

Christian M. Julien, Michel Massot, Chintalapalle V. Ramana

37

1. Introduction	37
2. The Raman Scattering Process	38
3. Raman Features of Manganese Oxides	47
4. Raman Features of Rock-salt Oxides	57
5. Raman Features of Lithium-based Phosphates	61
6. Concluding Remarks	67
References	69

Magnetic Properties of Lithium Intercalation Compounds

Christian M. Julien, Atmane Ait Salah, Alain Mauger, Francois Gendron

71

1. Introduction	71
2. Experimental	73
3. Magnetic Properties of Solid State Materials	74
4. Magnetic Properties of Layered Oxides	77
5. Magnetic Properties of Spinels	86
6. Magnetic Properties of Li-phosphates	91
7. Conclusions	97
References	98

Solid Electrolyte Interphase Formation in Rechargeable Li Batteries – I. General Considerations	
<i>Martin Winter, Kai-C. Möller, Jürgen O. Besenhard</i>	101
1. Introduction	101
2. Metallic Li Anodes in Rechargeable Lithium Batteries	103
3. Carbon Replaces Metallic Li in Rechargeable Lithium Batteries	105
4. SEI Formation on Graphite is a Special Case	106
5. SEI Formation on Lithium Storage Metals and Alloys	108
6. Other Requirements on the Electrolyte and Impacts on the SEI	111
References	114
Solid Electrolyte Interphase Formation in Rechargeable Li Batteries – II. SEI Forming Electrolyte Components and Additives	
<i>Martin Winter, Kai-C. Möller, Jürgen O. Besenhard</i>	117
1. Introduction	117
2. Electrolyte Additives	118
3. Electrolyte Additives and Lithium Storage Metals and Alloys	127
References	131
Highly Efficient Lithium Batteries	
<i>Branimir I. Banov, Anton A. Momchilov</i>	135
1. Introduction	136
2. Electrode Components – General Assumptions	139
3. Manganese Dioxide Spinel	141
4. Overlithiated Manganese Dioxide Spinel	143
5. Manganese Dioxide Spinel $\text{LiMe}_x\text{Mn}_{2-x}\text{O}_4$ ($0.01 < x < 0.20$) Modified with Foreign Ions (Me = Mg, Al)	146
6. Manganese Dioxide Spinel $(\text{MgO})_x\text{LiMn}_2\text{O}_4$ ($0.01 < x < 0.10$) Coated with Electrochemically Inactive MeO (Me = Mg, Zn)	151
7. Physicochemical Properties	156
References	161
Three Volts Vanadates – an Alternative of Four Volts Li Battery Cathode Materials	
<i>Anton A. Momchilov, Branimir I. Banov</i>	165
1. Introduction	166
2. Vanadium Bronzes	166
References	176

METAL HYDRIDE BATTERIES AND HYDROGEN STORAGE

Metal Hydride Electrodes for Battery Applications

Stoyan T. Bliznakov, Alexander K. Popov, Prokopi P. Andreev 177

1. MH Based Batteries-Current State and Future Trends 178
2. Electrochemistry of MH Based Batteries 180
3. Intermetallic Compounds as Materials for Negative Electrodes in MH Batteries 183
4. Preparation of MH Electrodes 210
5. Conclusions 211
- References 212

Hydrogen Storage in Metal Hydrides

Tony Spassov 217

1. Introduction 218
2. Hydriding Metals and Alloys 218
3. Review of Alloys and Composites for Hydrogen Storage 222
4. Nanostructured Magnesium Alloys and Composites for Hydrogen Storage 225
- References 253

SOLID STATE IN BATTERIES

Lithium Phosphate Based Glasses as Electrolytes for Li-ion Batteries

Isaac Abrahams, Emina Hadzifejzovic 257

1. Introduction to the Chemistry of Vitreous Phosphates 257
2. Solid State NMR Studies of Phosphate Glasses 265
3. Ionic Conductivity in Phosphate Glasses 270
4. Phosphate Based Li-ion Conducting Electrolyte Glasses 273
5. Conclusions 279
- References 279

Portable Batteries – Progress in the Market and Materials Research

Tamara H. Petkova 283

1. Present State of the Portable Solid State Batteries Market 284
2. Trends in the Batteries Market Development 285
3. Review of Electrolyte Materials by Battery Type 286
4. Structural Study of Chalcogenide Glass 295
5. Concluding Remarks 297
- References 298

METAL AIR BATTERIES

Metal-air Cells: Research and Development

Anastassia R. Kaisheva

301

1. Introduction 301
2. Air Gas-diffusion Electrode 302
3. Zinc-air Cells 321
4. Magnesium-air Cells 324
- References 328

SOLID OXIDE FUEL CELLS

Recent Developments and New Perspectives in Solid Oxide Fuel Cells Materials

*Antonio Barbucci, Paolo Piccardo, Maria Paola Carpanese,
Massimo Viviani*

329

1. Introduction 330
2. Basic Features of SOFC 331
3. Advanced Materials for Cells and Stacks 333
4. Future Trends 347
5. Concluding Remarks 355
- References 357

Interconnect Materials for Application in Planar Solid Oxide Fuel Cells

Kazimierz Przybylski

361

1. Introduction 362
2. Experimental Procedure 364
3. Results and Discussion 366
4. Summary 379
- References 381

ENERGY SOURCES TESTING AND INVESTIGATION

Inductance Errors Correction in Impedance Studies of Energy Sources

Daria E. Vladikova, Zdravko B. Stoykov, Gergana S. Raikova

383

1. Introduction 383
2. Analysis of the Inductance Errors 385
3. Calibration and Inductance Errors Correction 399
4. Conclusions 406
- References 409

Non-stationary Differential Impedance Spectroscopy in Energy Systems	
<i>Zdravko B. Stoynov, Daria E. Vladikova</i>	411
1. Introduction	412
2. Non-stationary Differential Impedance Spectroscopy	414
3. NODIS Applications	425
References	434
Differential Coulometry Spectroscopy	
<i>Zdravko B. Stoynov, Daria E. Vladikova</i>	437
1. Introduction	437
2. Principle of the Differential Coulometry Spectroscopy	438
3. Experimental	442
4. Discussion	448
References	449
Batteries Test and Management Instrumentation	
<i>Prokopi P. Andreev</i>	451
1. The Potentiostatic Control System	452
2. Battery Test Equipment	464
3. Intelligent Chargers and Clever Fuel Gauges	474
4. The Smart Battery Concept	483
5. Conclusions	497
References	499
Author index	505