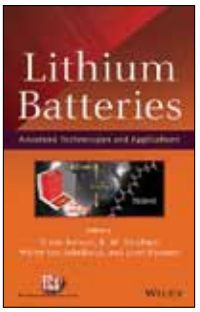
Books

Lithium Batteries: Advanced Technologies and Applications



Bruno Scrosati, K. M. Abraham, Walter van Schalkwijk, and Jusef Hassoun, Eds., John Wiley & Sons, Hoboken, NJ, $135, 392 pages, July 2013, ISBN: 978-1-118183-65-6

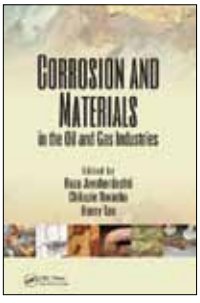
First commercialized in the early 1990s, lithium-ion batteries are now ubiquitous, powering everything from cellphones to laptop computers to electric cars. Despite great progress in the engineering and manufacturing of lithium-ion batteries, they are currently unable to meet the energy and power demands of many new and emerging applications.

This book, an entry in Wiley's Electrochemical Society Series, examines the current state of lithium-ion battery science, and points the way to the next generation of higher-energy-density, rechargeable Li-ion batteries through developments such as advanced battery chemistries and new electrode and electrolyte materials.

The first chapter sets the foundation for the rest of the book with a synopsis of the history of Li-ion batteries. The book then delves into topics such as advanced organic and ionic liquid electrolytes for battery applications; advanced cathode materials for Li-ion batteries; metal fluorosulfates capable of doubling the energy density of Li-ion batteries; efforts to develop Li-air batteries; rechargeable batteries with alternative anodes (*e.g.*, magnesium or sodium); and more. The chapters are contributed by experts in electrochemistry and lithium battery technology, and are based on the latest published research and first-hand laboratory experience.

The book offers researchers and students of electrochemistry a snapshot of the efforts to improve battery performance, as well as the tools needed to advance their own research.

Corrosion and Materials in the Oil and Gas Industries



Reza Javaherdashti, Chikezie Nwaoha, and Henry Tan, Eds., CRC Press, Boca Raton, FL, $200, 721 pages, April 2013, ISBN: 978-1-466556-24-9

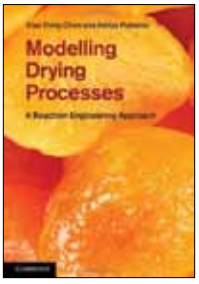
Corrosion negatively impacts virtually all industrial infrastructure. To meet the challenges of increased production, associated corrosion threats, and aging infrastructure, engineers, technologists, project planners, and facility managers need to have a thorough understanding of the underlying mechanisms of corrosion, and the properties of materials.

Drawing on the expertise of contributors from oil- and gas-producing countries, this book presents the state of the art in corrosion management, including strategies for corrosion identification, prevention, and mitigation. It also discusses the limitations and misunderstandings connected with current corrosion management, providing readers with insight for finding solutions and better interpreting the findings of field tests.

The book begins by explaining the properties of construction materials and the causes of degradation, and includes a chapter on microbial corrosion. It then delves into inspection and maintenance issues, examining material selection, metallurgy, corrosion-prevention strategies, and the role of design. It also provides models for estimating corrosion damage and selecting mitigation and monitoring techniques. The concluding chapters address corrosion hazards, safety and risk, reliability, and economic considerations. The book also links corrosion mitigation and the management of asset integrity, highlighting the need for companies to maintain their infrastructure to remain competitive.

The book should be a valuable reference for anyone involved in corrosion management and materials selection, particularly in the oil and gas industries.

Modelling Drying Processes: A Reaction Engineering Approach



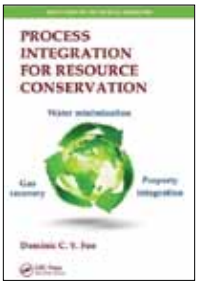
Xiao Dong Chen and Aditya Putranto, Cambridge Univ. Press, New York, NY, $120, 252 pages, July 2013, ISBN: 978-1-107012-10-3

Drying is one of the oldest and most effective methods for preserving foods and biological materials. Other types of dried products include construction materials, textiles, electronic components, biomass-based fuels, pharmaceuticals, and more. Because industrial drying is an energy-intensive process, optimization (as well as the designing of new dryers) is often needed to achieve the goals of energy reduction and quality improvement. Modelling of drying processes is useful for these purposes.

This book presents the ideas behind the reaction engineering approach (REA) to drying processes, starting with the formulation, modelling, and applications of the lumped-REA. It then details the use of the REA to describe local evaporation and condensation, and pairs the REA with equations of mass and energy conservation to model non-equilibrium multiphase drying. The book also reviews other established drying models, discussing their features and limitations and comparing them with the REA. Application examples illustrate how to implement the REA models

for process design. The book also discusses the REA for computational fluid dynamics-based modelling, and further expands it to model other simultaneous heat- and mass-transfer processes.

Process Integration for Resource Conservation



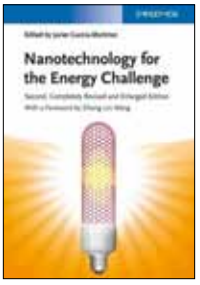
Dominic C. Y. Foo, CRC Press, Boca Raton, FL, $140, 606 pages, July 2012, ISBN: 978-1-466573-32-1

Tremendous quantities of natural raw materials and energy are used to manufacture chemical products. To achieve environmental sustainability in industrial plants, resource conservation activities such as material recovery have begun incorporating process integration techniques for reusing and recycling water, utility gases, solvents, and solid waste.

This book, part of the publisher's Green Chemistry and Chemical Engineering Series, presents state-of-the-art, cost-effective techniques for a variety of conservation problems. It emphasizes the process-integration approach of setting performance targets ahead of detailed design, and describes the automated targeting model, an advanced targeting technique that incorporates pinch analysis into mathematical modeling. The book guides readers through case studies of industrial process integration and material recovery across a variety of different plants. The use of spreadsheets to track performance and to design resource conservation networks is also demonstrated, and the book includes access to downloadable worksheets, calculation files, and demonstration software from the publisher's website.

The book aims to bridge the gap between academic and industrial practitioners in chemical, process, and environmental engineering.

Nanotechnology for the Energy Challenge, 2nd Edition



Javier García-Martínez, Ed., Wiley-VCH, Weinheim, Germany, $212, 664 pages, Aug. 2013, ISBN: 978-3-527333-80-6

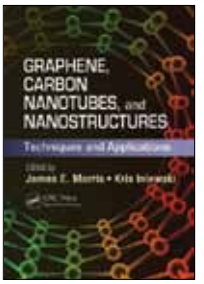
The development of new energy sources will be an enormous challenge for civilizations around the world for the foreseeable future. Over the last two decades, breakthroughs in nanotechnology have opened up the possibility of moving beyond conventional energy generation approaches by introducing technologies that are more efficient, environmentally sound, and cost-effective.

This updated edition brings together international experts for a survey of the latest developments in nanotechnology and its applications in the energy sector — including entirely new chapters on graphene, piezo-electric nanomaterials, and nanocatalysts for Fischer–Tropsch synthesis.

The book is organized around three themes. The first part covers the key developments in nanotechnology for clean energy production and conversion. Following an overview of the contributions of nanomaterials for energy production, subsequent chapters elaborate on topics such as photodevices, thermoelectric materials, and fuel cells. The book's second part is devoted to the use of nanomaterials in more-efficient energy storage systems, such as batteries, superconductors, and materials for hydrogen storage. The book's final section discusses how nanotechnology can lead to more-efficient energy usage while reducing negative environmental impacts.

This volume should be valuable to researchers who specialize in the applications of nanotechnology in energy, as well as to advanced students engaged in energy research.

Graphene, Carbon Nanotubes, and Nanostructures: Techniques and Applications



James E. Morris and Krzysztof Iniewski, Eds., CRC Press, Boca Raton, FL, $130, 364 pages, Feb. 2013, ISBN: 978-1-466560-56-7

An entry in the publisher's Devices, Circuits, and Systems Series, this book reviews recent advances in nanofabrication technology, and explores the current and potential applications that this technology has enabled. It examines the historical evolution and emerging technologies of nanofabrication, and analyzes some of the most important underlying nanofabrication technologies, with an emphasis on graphene, carbon nanotubes (CNTs), and nanowires.

Nearly four dozen experts from companies and academic institutions around the world contribute to the book's comprehensive coverage. The wide-ranging topics include: CNT electrodynamics and signal propagation models; fabrication of transparent CNT electrodes for organic light-emitting diodes; direct graphene growth on dielectric substrates; CNTs as promising candidates for next-generation interconnect conductors; approaches to integrating CNTs with the complementary metal oxide semiconductors (CMOS) design; CNTs in electrochemical and optical biosensors; the use of DNA nanostructures in lithography; CMOS-compatible silicon nanowire biosensors; the use of titanium oxide-B nanowires to detect explosive vapors; nanostructured thin-film production using microreactors; and more. CEP