New Inside Electric Vehicle Battery Tray Development

The topics of interest in this book include significant challenges in the BMS design of EV/HEV. The equivalent models developed for several types of integrated Li-ion batteries consider the environmental temperature and ageing effects. Different current profiles for testing the robustness of the Kalman filter type estimators of the battery state of charge are used in this book. Additionally, the BMS can integrate a real-time model-based sensor Fault Detection and Isolation (FDI) scheme for a Li-ion cell undergoing degradation, which uses the recursive least squares (RLS) method to estimate the equivalent circuit model (ECM) parameters. This book will fully meet the demands of a large community of readers and specialists working in the field due to its attractiveness and scientific content with a great openness to the side of practical applicability. This covers various interesting aspects, especially related to the characterization of commercial batteries, diagnosis and optimization of their performance, experimental testing and statistical analysis, thermal modelling, and implementation of the most suitable Kalman filter type estimators of high accuracy to estimate the state of charge

Advances in Battery Technologies for Electric VehiclesWoodhead Publishing

A WALL STREET JOURNAL BUSINESS BESTSELLER • The riveting inside story of Elon Musk and Tesla's bid to build the world's greatest car—from award-winning Wall Street Journal tech and auto reporter Tim Higgins. “A deeply reported and business-savvy chronicle of Tesla's wild ride.” —Walter Isaacson, New York Times Book Review Tesla is the envy of the automotive world. Born at the start of the millennium, it was the first car company to be valued at $1 trillion. Its CEO, the mercurial, charismatic Elon Musk has become not just a celebrity but the richest man in the world. But Tesla’s success was far from guaranteed. Founded in the 2000s, the company was built on an audacious vision. Musk and a small band of Silicon Valley engineers set out to make a car that was quicker, sexier, smoother, and cleaner than any gas-guzzler on the road. Tesla would undergo a hellish fifteen years, beset by rivals—pressured by investors, hobbled by whistleblowers. Musk often found himself in the public’s crosshairs, threatening to bring down the company he had helped build. Wall Street Journal tech and auto reporter Tim Higgins had a front-row seat for the drama: the pileups, breakdowns, and the unlikeliest outcome of all, success. A story of impossible wagers and unlikely triumphs, Power Play is an exhilarating look at how a team of innovators beat the odds—and changed the future.

Electric drive vehicles (EDVs) are seen on American roads in increasing numbers. Related to this market trend and critical for it to increase are improvements in battery technology. Battery Technology for Electric Vehicles examines in detail at the research support from the U.S. Department of Energy (DOE) for the development of nickel-metal-hydride (NiMH) and lithium-ion (Li-ion) batteries used in EDVs. With public support comes accountability of the social outcomes associated with public investments. The book overviews DOE investments in advanced battery technology, documents the adoption of these batteries in EDVs on the road, and calculates the economic benefits associated with these improved technologies. It provides a detailed global evaluation of the net social benefits associated with DOEs investments, the results of the benefit-to-cost ratio of over 3.6-to-1, and the life-cycle approach that allows adopted EDVs to remain on the road over their expected future life, thus generating economic and environmental health benefits into the future.

Batteries for Electric Vehicles

The Recovery Act

Build Your Own Electric Vehicle, Third Edition

Battery Management Algorithm for Electric Vehicles

Public Policy, Innovation and Strategy

Electric Vehicle Battery Systems provides operational theory and design guidance for engineers and technicians working to design and develop efficient electric vehicle (EV) power sources. As Zero Emission Vehicles become a requirement in more areas of the world, the technology required to design and maintain their complex battery systems is needed not only by the vehicle designers, but by those who will provide recharging and maintenance services, as well as utility infrastructure providers. Includes fuel cell and hybrid vehicle applications. Written with cost and efficiency foremost in mind, Electric Vehicle Battery Systems offers essential details on failure mode analysis of VRLA, NiMH battery systems, the fast-charging of electric vehicle battery systems based on Pb-acid, NiMH, Li-ion technologies, and much more. Key coverage includes issues that can affect electric vehicle performance, such as total battery capacity, battery charging and discharging, and battery temperature constraints. The author also explores electric vehicle performance, battery testing (15 core performance tests provided), lithium-ion batteries, fuel cells and hybrid vehicles. In order to make a practical electric vehicle, a thorough understanding of the operation of a set of batteries in a pack is necessary. Expertly written and researched, Electric Vehicle Battery Systems will prove invaluable to automotive engineers, electronics and integrated circuit design engineers, and anyone whose interests involve electric vehicles and battery systems. * Addresses cost and efficiency as key elements in the design process * Provides comprehensive coverage of the theory, operation, and configuration of complex battery systems, including Pb-acid, NiMH, and Li-ion technologies * Provides comprehensive coverage of the theory, operation, and configuration of complex battery systems, including Pb-acid, NiMH, and Li-ion technologies

Probably The Best Tesla Model S Guide To Date. There has never been a Tesla Model S Guide like this. It contains 113 answers, much more than you can imagine; comprehensive answers and extensive details and references, with insights that have never before been offered in print. Get the information you need--fast! This all-embracing guide offers a thorough view of key knowledge and detailed insight. This Guide introduces what you want to know about Tesla Model S. A quick look inside of some of the subjects covered: Charge point - Charging time, Motor

Trend SUV of the Year - Car of the Year, Tesla Model 3 - Daimler AG, Electric vehicle infrastructure - Automobile manufacturers, Electric car - Tesla Motors, Better Place - Similar projects, History of the electric vehicle - 2000s to present: Modern highway-capable electric cars, Tesla Model 3 - Overview, Plug-in electric vehicle fire incidents - Tesla Model S, All-electric vehicle - Batteries, Plug-in electric vehicle - Battery swapping, Tesla Factory - Production, Toyota RAV4 - RAV4 EV, Electric car - Risk of fire, Electric car - 1990s to present: Revival of interest, Electric car - Transmission, Tesla Factory - History, Tegra 3 - History, Mercedes-Benz CLA-Class - Overview (2013-), Tesla Roadster - Service, Electric car - Hazard to pedestrians, Plug-in electric vehicle - Risks associated with noise reduction, All-electric car - Transmission, Tesla Roadster - History, Plug-in Car Grant - United Kingdom, Plug-in Car Grant - New proposals, Tesla Motors - Crashes and fire, Electric vehicles - Reintroduction, Electric car - Price, Plug-in electric vehicle - Rare earth metals availability and supply security, Tesla Model 3 - Model S, Plug-in hybrid - By country, All-electric car - Hazard to pedestrians, BMW i3 REx - Charging and connectivity, Alternative fuel car - Battery-electric, and much more...

From the invention of eyeglasses to the Internet, this three-volume set examines the pivotal effects that inventions have had on society, providing a fascinating history of technology and innovations in the United States from the earliest colonization by Europeans to the present. • Encourages readers to consider the tremendous potential impact of advances in science and technology and the ramifications of important inventions on the global market, human society, and even the planet as a whole • Supports eras addressed in the National Standards for American history as well as curricular units on inventions, discoveries, and technological advances • Includes primary documents, a chronology, and section openers that help readers contextualize the content

Advances in Battery Technologies for Electric Vehicles provides an in-depth look into the research being conducted on the development of more efficient batteries capable of long distance travel. The text contains an introductory section on the market for battery and hybrid electric vehicles, then thoroughly presents the latest on lithium-ion battery technology. Readers will find sections on battery pack design and management, a discussion of the infrastructure required for the creation of a battery powered transport network, and coverage of the issues involved with end-of-life management for these types of batteries. Provides an in-depth look into new research on the development of more efficient, long distance travel batteries Contains an introductory section on the market for battery and hybrid electric vehicles Discusses battery pack design and management and the issues involved with end-of-life management for these types of batteries

Plug-in Hybrid Electric Vehicle (PHEV)

Overcoming Barriers to Deployment of Plug-in Electric Vehicles

The Tech Behind Electric Cars

Battery Technology for Electric Vehicles

A New Era in Automotive Technology

Prospective Life-cycle Assessment of Second-life Electric Vehicle Batteries and Uranium Extraction in the Us

Drive into the 21st century in an electric car With falling cost of ownership, expanded incentives for purchasing, and more model and body type options than ever, it may finally be time to retire the old gas-guzzler and dive into the world of electric car ownership. Electric Cars For Dummies is your guide to becoming lightning powered, reducing your carbon footprint, and saving money on gas while you do it. This book teaches you how to select the battery-charged vehicle that fits your need and budget. It also offers insight into how to maintain your electric car, including answering all your questions about charging your vehicle. Calculate the total cost of ownership, prep your home to become one huge charger, and demystify the battery, the tune-ups and more. Learn the difference in cost of ownership and emissions between electric and gas-powered vehicles Explore your options and find an electric car that fits in your budget Know when and how to charge your vehicle, and what kind of maintenance it needs Figure out how to charge your car on the go This is the perfect book for new and would-be electric car owners looking for guidance on buying and maintaining one of these super sleek machines.

We may be standing on the precipice of a revolution in propulsion not seen since the internal combustion engine replaced the horse and buggy. The anticipated proliferation of electric cars will influence the daily lives of motorists, the economies of different countries and regions, urban air quality and global climate change. If you want to understand how quickly the transition is likely to occur, and the factors that will influence the predictions of the pace of the transition, this book will be an illuminating read.

This edited volume presents research results of the PPP European Green Vehicle Initiative (EGVI), focusing on electric vehicle batteries. Electrification is one road towards sustainable road transportation, and battery technology is one of the key enabling technologies. However, at the same time, battery technology is one of the main obstacles for a broad commercial launch of electric vehicles. This book includes research contributions which try to bridge the gap between research and innovation in the field of battery technology for electric vehicles. The target audience primarily comprises researchers and experts in the field.

Engineers are designing electric cars to replace public transportation, personal vehicles, and semitrucks--all while powered by electricity instead of fossil fuels. Inside Electric Cars introduces readers to the uses of electric cars, the hardware and software that make electric cars possible, and the future of electric car technology. Aligned to Common Core Standards and correlated to state standards. Core Library is an imprint of Abdo Publishing, a division of ABDO.

Hybrid and Electric Vehicles

Technology and Expectations in the Automobile Age

Long Hard Road

Modeling and Simulation of Lithium-ion Power Battery Thermal Management

Tesla Model S 113 Success Secrets - 113 Most Asked Questions on Tesla Model S - What You Need to Know

Battery Health, Performance, Safety, and Cost

The world of electric vehicles is constantly evolving. Scientists are finding new ways to make electric cars more efficient, such as new and advanced battery technologies with

longer lifespans and less energy consumption. The Future of Electric Vehicle Battery Technology is another enlightening plethora of the most up-to-date information and news on electric vehicles, following Dr. Taiwo Ayodele's previous book on electric cars, The Future of Electric Vehicles, A Sustainable Solution. This book explains the basics of the electric car and its battery before going into detail about advanced battery technologies for electric vehicles, such as lithium-ion batteries, solar energy, and more advancements in battery technology that eliminate range anxieties and put the buyers' mind at rest.

This book gives the reader a detailed introduction to electric vehicles with its technical functionalities, their benefits over internal combustion engines, the interworkings of their different energy sources, their future in politics, and why they are the perfect cars for consumers almost anywhere.

This book surveys state-of-the-art research on and developments in lithium-ion batteries for hybrid and electric vehicles. It summarizes their features in terms of performance, cost, service life, management, charging facilities, and safety. Vehicle electrification is now commonly accepted as a means of reducing fossil-fuels consumption and air pollution. At present, every electric vehicle on the road is powered by a lithium-ion battery. Currently, batteries based on lithium-ion technology are ranked first in terms of performance, reliability and safety. Though other systems, e.g., metal-air, lithium-sulphur, solid state, and aluminium-ion, are now being investigated, the lithium-ion system is likely to dominate for at least the next decade – which is why several manufacturers, e.g., Toyota, Nissan and Tesla, are chiefly focusing on this technology. Providing comprehensive information on lithium-ion batteries, the book includes contributions by the world’s leading experts on Li-ion batteries and vehicles.

A comprehensive examination of advanced battery management technologies and practices in modern electric vehicles Policies surrounding energy sustainability and environmental impact have become of increasing interest to governments, industries, and the general public worldwide. Policies embracing strategies that reduce fossil fuel dependency and greenhouse gas emissions have driven the widespread adoption of electric vehicles (EVs), including hybrid electric vehicles (HEVs), pure electric vehicles (PEVs) and plug-in electric vehicles (PHEVs). Battery management systems (BMSs) are crucial components of such vehicles, protecting a battery system from operating outside its Safe Operating Area (SOA), monitoring its working conditions, calculating and reporting its states, and charging and balancing the battery system. Advanced Battery Management Technologies for Electric Vehicles is a compilation of contemporary model-based state estimation methods and battery charging and balancing techniques, providing readers with practical knowledge of both fundamental concepts and practical applications. This timely and highly-relevant text covers essential areas such as battery modeling and battery state of charge, energy, health and power estimation methods. Clear and accurate background information, relevant case studies, chapter summaries, and reference citations help readers to fully comprehend each topic in a practical context. Offers up-to-date coverage of modern battery management technology and practice Provides case studies of real-world engineering applications Guides readers from electric vehicle fundamentals to advanced battery management topics Includes chapter introductions and summaries, case studies, and color charts, graphs, and illustrations Suitable for advanced undergraduate and graduate coursework, Advanced Battery Management Technologies for Electric Vehicles is equally valuable as a reference for professional researchers and engineers.

As our world's population grows, so to does our need for energy. Scientists seek the next breakthrough in new technology while constantly finding ways to make current solutions cheaper and more efficient. In this title, discover what hybrid and electric vehicles are, their history, how we use them today, and how new technologies can contribute to our energy future. Learn about exciting new ways to power cars, including plug-in hybrid technology, lithium batteries, fuel cells, and solar-electric systems. Sidebars, full-color photos, full-spread diagrams, well-placed graphs, charts, and maps, stories highlighting innovations in action, and a glossary enhance this engaging title. Aligned to Common Core Standards and correlated to state standards. Essential Library is an imprint of Abdo Publishing, a division of ABDO.

The Future of Electric Vehicle Battery Technology

The Lithium-Ion Battery and the Electric Car

Development and Future of Battery, Hybrid and Fuel-cell Cars

Hybrid Electric Vehicles

The Electric Car

Lessons Learned in Acquiring New Regulations for Shipping Advanced Electric Vehicle Batteries

The book provides easy interpretable explanations for the key technologies involved in Electric Vehicles and Hybrid Electric Vehicles. The authors discuss the various electrical machines, drives, and controls used in EV and HEV. The book provides a detailed coverage of Regenerative Braking Systems used in EV and HEV. The book also illustrates the battery technology and battery management systems in EV and HEV. This book is intended for academicians, researchers and industrialists. In addition, this book has the following features Discusses the various Economic and Environmental Impact of Electric and Hybrid Electric Vehicles Discusses the role of Artificial Intelligence in Electric / Hybrid Electric Vehicles Illustrates the concept of Vehicle to Grid Technology and the smart charging station infrastructure and issues involved in the same Elucidates the concept of Internet of Vehicles Presents the latest research and applications in alternate energy vehicles

Electric cars have come a long way since the first gasoline-electric hybrid vehicles hit the market in the late 1990s. Some modern electric cars boast a range of nearly 300 miles (483 kilometers) on one charge. And they're not all for the tame of heart. Some electric-powered sports cars can reach top speeds of 250 miles (402 km) per hour! Take young readers on a journey through the technology that makes electric cars so amazing.

This book systematically introduces readers to the core algorithms of battery management system (BMS) for electric vehicles. These algorithms cover most of the technical bottlenecks encountered in BMS applications, including battery system modeling, state of charge (SOC) and state of health (SOH) estimation, state of power (SOP) estimation, remaining useful life (RUL) prediction, heating at low temperature, and optimization of charging. The book not only presents these algorithms, but also discusses their background, as well as related experimental and hardware developments. The concise figures and program codes provided make the calculation process easy to follow and apply, while the results obtained are presented in a comparative way, allowing readers to intuitively grasp the characteristics of different algorithms. Given its scope, the book is intended for researchers, senior undergraduate and graduate students, as well as engineers in the fields of electric vehicles and energy storage.

Lithium batteries may hold the key to an environmentally sustainable, oil-independent future. From electric cars to a "smart" power grid that can actually store electricity, letting us harness the powers of the sun and the wind and use them when we need them, lithium—a metal half as dense as water, found primarily in some of the most uninhabitable places on earth—has the potential to set us on a path toward a low-carbon energy economy. In Bottled Lightning, the science reporter Seth Fletcher takes us on a fascinating journey, from the salt flats of Bolivia to the labs of MIT and Stanford, from the turmoil at GM to cutting-edge lithium-ion battery start-ups, introducing us to the key players and ideas in an industry with the power to reshape the world. Lithium is the thread that ties together many key stories of our time: the environmental movement; the American auto industry, staking its revival on the electrification of cars and trucks; the struggle between first-world countries in need of natural resources and the impoverished countries where those resources are found; and the overwhelming popularity of the portable, Internet-connected gadgets that are changing the way we communicate. With nearly limitless possibilities, the promise of lithium offers new hope to a foundering American economy desperately searching for a green-tech boom to revive it.

Electric Cars For Dummies

Hearing Before the Subcommittee on Energy Research and Production of the Committee on Science and Technology, U.S. House of Representatives, Ninety-sixth Congress, First Session, November 26, 1979

Electric Vehicle Technology Explained

Power Play

Behaviour of Lithium-Ion Batteries in Electric Vehicles

Thermal Management of Electric Vehicle Battery Systems

One hopes, as a new generation of electric vehicles becomes a reality, The Electric Vehicle offers a long-overdue reassessment of the place of this technology in the history of street transportation.

This book focuses on the thermal management technology of lithium-ion batteries for vehicles. It introduces the charging and discharging temperature characteristics of lithium-ion batteries for vehicles, the method for modeling heat generation of lithium-ion batteries, experimental research and simulation on air-cooled and liquid-cooled heat dissipation of lithium-ion batteries, lithium-ion battery heating method based on PTC and wide-line metal film, self-heating using sinusoidal alternating current. This book is mainly for practitioners in the new energy vehicle industry, and it is suitable for reading and reference by researchers and engineering technicians in related fields such as new energy vehicles, thermal management and batteries. It can also be used as a reference book for undergraduates and graduate students in energy and power, electric vehicles, batteries and other related majors.

In the past few years, interest in plug-in electric vehicles (PEVs) has grown. Advances in battery and other technologies, new federal standards for carbon-dioxide emissions and fuel economy, state zero-emission-vehicle requirements, and the current administration's goal of putting millions of alternative-fuel vehicles on the road have all highlighted PEVs as a transportation alternative. Consumers are also beginning to recognize the advantages of PEVs over conventional vehicles, such as lower operating costs, smoother operation, and better acceleration; the ability to fuel up at home; and zero tailpipe emissions when the vehicle operates solely on its battery. There are, however, barriers to PEV deployment, including the vehicle cost, the short all-electric driving range, the long battery charging time, uncertainties about battery life, the few choices of vehicle models, and the need for a charging infrastructure to support PEVs. What should industry do to improve the performance of PEVs and make them more attractive to consumers? At the request of Congress, Overcoming Barriers to Deployment of Plug-in Electric Vehicles identifies barriers to the introduction of electric vehicles and recommends ways to mitigate these barriers. This report examines the characteristics and capabilities of electric vehicle technologies, such as cost, performance, range, safety, and durability, and assesses how these factors might

create barriers to widespread deployment. Overcoming Barriers to Deployment of Plug-in Electric Vehicles provides an overview of the current status of PEVs and makes recommendations to spur the industry and increase the attractiveness of this promising technology for consumers. Through consideration of consumer behaviors, tax incentives, business models, incentive programs, and infrastructure needs, this book studies the state of the industry and makes recommendations to further its development and acceptance.

This book covers the development of electric cars -- from their early days to new hybrid models in production -- together with the very latest technological issues faced by automotive engineers working on electric cars, as well as the key business factors vital for the successful transfer of electric cars into the mass market. Considerable work has gone into electric car and battery development in the last ten years with the prospect of substantial improvements in range and performance in battery cars as well as in hybrids and those using fuel cells. This book comprehensively covers this important subject and will be of particular interest to engineers and managers working in the automotive and transport industries.

Fundamentals and Applications of Lithium-ion Batteries in Electric Drive Vehicles

Storage Batteries for Electric Vehicle Applications

The Powerhouse

Superbatteries, Electric Cars, and the New Lithium Economy

Advances in Battery Technologies for Electric Vehicles

Reports of the PPP European Green Vehicles Initiative

BUILD, CONVERT, OR BUY A STATE-OF-THE-ART ELECTRIC VEHICLE Thoroughly revised and expanded, Build Your Own Electric Vehicle, Third Edition, is your go-to guide for converting an internal combustion engine vehicle to electric or building an EV from the ground up. You'll also find out about the wide variety of EVs available for purchase and how they're being built. This new edition details all the latest breakthroughs, including AC propulsion and regenerative braking systems, intelligent controllers, batteries, and charging technologies. Filled with updated photos, this cutting-edge resource fully describes each component--motor, battery, controller, charger, and chassis--and provides illustrated, step-by-step instructions on how to assemble all the parts. Exclusive web content features current supplier and dealer lists. Custom-built for environmentalists, engineers, students, hobbyists, and mechanics, this hands-on guide puts you in the fast lane toward a cost-effective, reliable green machine. Build Your Own Electric Vehicle, Third Edition, covers: Environmental impact and energy savings The best EV for you--purchase trade-offs, conversion trade-offs, and conversion costs Chassis and design Different types of electric motors and controllers Lithium EV batteries Chargers and electrical systems EV builds and conversions Licensing and insuring your EV Driving and maintenance List of manufacturers and dealers regularly updated on website

We may be standing at the precipice of a revolution in propulsion not seen since the internal combustion engine replaced the horse and buggy. The proliferation of electric cars will change the daily lives of motorists, boost some regional economies and hurt others, reduce oil insecurity but create new insecurities about raw materials, and impact urban air quality and climate change. If you want to understand how quickly the transition is likely to occur, and the factors shaping the pace of the transition, this book delivers with a candid, illuminating style. The invention of the lithium-ion battery and its adaptation to the auto sector set the stage for the exciting proliferation of electric cars, beginning with California and Norway. This book focuses on the period from the oil crises of the 1970s to the present, tracing the development of this entirely new industry and its critical supply chain. John Graham delves into the major societal concerns, economic rationales, governmental policies and corporate strategies. He emphasizes that consumer concerns slowed the pace of the transition while spurring more innovation and new policies to persuade reluctant consumers. And he explains why the transition is now occurring much faster in China and Europe than in Japan and the United States. More broadly, the book tells the story of many successes and failures in public policy, technological innovation and corporate strategy. This book provides an in-depth understanding of how people on every continent in the world are contributing to the new electric-vehicle industry, including the raw materials, battery components, electric motors and charging stations. Faculty, students and researchers will appreciate the integrated treatment of the technical, economic, political and international issues. For the practitioner in industry, government and civil society, the book is an engaging look at the roles of key decision makers and organizations, both those favoring electric cars and those opposed.

Climate change, urban air quality, and dependency on crude oil are important societal challenges. In the transportation sector especially, clean and energy efficient technologies must be developed. Electric vehicles (EVs) and plug-in hybrid electric vehicles (PHEVs) have gained a growing interest in the vehicle industry. Nowadays, the commercialization of EVs and PHEVs has been possible in different applications (i.e., light duty, medium duty, and heavy duty vehicles) thanks to the advances in energy storage systems, power electronics converters (including DC/DC converters, DC/AC inverters, and battery charging systems), electric machines, and energy efficient power flow control strategies. This book is based on the Special Issue of the journal Applied Sciences on "Plug-In Hybrid Electric Vehicles (PHEVs)". This collection of research articles includes topics such as novel propulsion systems, emerging power electronics and their control algorithms, emerging electric machines and control techniques, energy storage systems, including BMS, and efficient energy management strategies for hybrid propulsion, vehicle-to-grid (V2G), vehicle-to-home (V2H), grid-to-vehicle (G2V) technologies, and wireless power transfer (WPT) systems.

This fundamental guide teaches readers the basics of battery design for electric vehicles. Working through this book, you will understand how to optimise battery performance and functionality, whilst minimising costs and maximising durability. Beginning with the basic concepts of electrochemistry, the book moves on to describe implementation, control and management of batteries in real vehicles, with respect to the battery materials. It describes how to select cells and

batteries with explanations of the advantages and disadvantages of different battery chemistries, enabling readers to put their knowledge into practice and make informed and successful design decisions, with a thorough understanding of the trade-offs involved. The first of its kind, and written by an industry expert with experience in academia, this is an ideal resource for both students and researchers in the fields of battery research and development as well as for professionals in the automotive industry extending their interest towards electric vehicles.

The Global Rise of the Modern Plug-In Electric Vehicle

transforming America's transportation sector, batteries and electric vehicles

Tesla, Elon Musk, and the Bet of the Century

E-Mobility

The Electric Vehicle

Electric Vehicle Batteries: Moving from Research towards Innovation

The latest developments in the field of hybrid electric vehicles Hybrid Electric Vehicles provides an introduction to hybrid vehicles, which include purely electric, hybrid electric, hybrid hydraulic, fuel cell vehicles, plug-in hybrid electric, and off-road hybrid vehicular systems. It focuses on the power and propulsion systems for these vehicles, including issues related to power and energy management. Other topics covered include hybrid vs. pure electric, HEV system architecture (including plug-in & charging control and hydraulic), off-road and other industrial utility vehicles, safety and EMC, storage technologies, vehicular power and energy management, diagnostics and prognostics, and electromechanical vibration issues. Hybrid Electric Vehicles, Second Edition is a comprehensively updated new edition with four new chapters covering recent advances in hybrid vehicle technology. New areas covered include battery modelling, charger design, and wireless charging. Substantial details have also been included on the architecture of hybrid excavators in the chapter related to special hybrid vehicles. Also included is a chapter providing an overview of hybrid vehicle technology, which offers a perspective on the current debate on sustainability and the environmental impact of hybrid and electric vehicle technology. Completely updated with new chapters Covers recent developments, breakthroughs, and technologies, including new drive topologies Explains HEV fundamentals and applications Offers a holistic perspective on vehicle electrification Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives, Second Edition is a great resource for researchers and practitioners in the automotive industry, as well as for graduate students in automotive engineering.

A theoretical and technical guide to the electric vehicle lithium-ion battery management system Covers the timely topic of battery management systems for lithium batteries. After introducing the problem and basic background theory, it discusses battery modeling and state estimation. In addition to theoretical modeling it also contains practical information on charging and discharging control technology, cell equalisation and application to electric vehicles, and a discussion of the key technologies and research methods of the lithium-ion power battery management system. The author systematically expounds the theory knowledge included in the lithium-ion battery management systems and its practical application in electric vehicles, describing the theoretical connotation and practical application of the battery management systems. Selected graphics in the book are directly derived from the real vehicle tests. Through comparative analysis of the different system structures and different graphic symbols, related concepts are clear and the understanding of the battery management systems is enhanced. Contents include: key technologies and the difficulty point of vehicle power battery management system; lithium-ion battery performance modeling and simulation; the estimation theory and methods of the lithium-ion battery state of charge, state of energy, state of health and peak power; lithium-ion battery charge and discharge control technology; consistent evaluation and equalization techniques of the battery pack; battery management system design and application in electric vehicles. A theoretical and technical guide to the electric vehicle lithium-ion battery management system Using simulation technology, schematic diagrams and case studies, the basic concepts are described clearly and offer detailed analysis of battery charge and discharge control principles Equips the reader with the understanding and concept of the power battery, providing a clear cognition of the application and management of lithium ion batteries in electric vehicles Arms audiences with lots of case studies Essential reading for Researchers and professionals working in energy technologies, utility planners and system engineers.

The Obama Administration is investing in a broad portfolio of advanced vehicle technologies. These investments--investments in American ingenuity, innovation, and manufacturing--are driving down the costs associated with electric vehicles and expanding the domestic market. Investments in batteries alone, for example, should help lower the cost of some electric car batteries by nearly 70 percent before the end of 2015. What's

more, thanks in part to these investments, U.S. factories will be able to produce batteries and components to support up to 500,000 electric-drive vehicles annually by 2015. Overall, these investments will create tens of thousands of American jobs. As part of the Department of Energy's $12 billion investment in advanced vehicle technologies, the Department is investing more than $5 billion to electrify America's transportation sector. These investments under the American Recovery and Reinvestment Act and DOE's Advanced Technology Vehicle Manufacturing (ATVM) Loan Program are supporting the development, manufacturing, and deployment of the batteries, components, vehicles, and chargers necessary to put millions of electric vehicles on America's roads. The Recovery Act included $2.4 billion to establish 30 electric vehicle battery and component manufacturing plants and support some of the world's first electric vehicle demonstration projects. For every dollar of the $2.4 billion, the companies have matched it at minimum dollar for dollar. Additionally, DOE's Advanced Research Projects Agency-Energy (ARPA-E) is providing over $80 million for more than 20 transformative research and development projects with the potential to take batteries and electric drive components beyond today's best technologies, and the Advanced Energy Manufacturing Tax Credit program is helping expand U.S.-based manufacturing operations for advanced vehicle technologies. The Obama Administration has also provided nearly $2.6 billion in ATVM loans to Nissan, Tesla and Fisker to establish electric vehicle manufacturing facilities in Tennessee, California and Delaware, respectively. Projects have now begun constructing new manufacturing plants, adding new manufacturing lines, building electric vehicles, and installing electric vehicle charging stations, creating thousands of new jobs across the country. These combined investments are helping the economy grow now, while positioning the U.S. for global leadership in the electric vehicle industry for years to come.

Thermal Management of Electric Vehicle Battery Systems provides a thorough examination of various conventional and cutting edge electric vehicle (EV) battery thermal management systems (including phase change material) that are currently used in the industry as well as being proposed for future EV batteries. It covers how to select the right thermal management design, configuration and parameters for the users' battery chemistry, applications and operating conditions, and provides guidance on the setup, instrumentation and operation of their thermal management systems (TMS) in the most efficient and effective manner. This book provides the reader with the necessary information to develop a capable battery TMS that can keep the cells operating within the ideal operating temperature ranges and uniformities, while minimizing the associated energy consumption, cost and environmental impact. The procedures used are explained step-by-step, and generic and widely used parameters are utilized as much as possible to enable the reader to incorporate the conducted analyses to the systems they are working on. Also included are comprehensive thermodynamic modelling and analyses of TMSs as well as databanks of component costs and environmental impacts, which can be useful for providing new ideas on improving vehicle designs. Key features: Discusses traditional and cutting edge technologies as well as research directions Covers thermal management systems and their selection for different vehicles and applications Includes case studies and practical examples from the industry Covers thermodynamic analyses and assessment methods, including those based on energy and exergy, as well as exergoeconomic, exergoenvironmental and enviroeconomic techniques Accompanied by a website hosting codes, models, and economic and environmental databases as well as various related information Thermal Management of Electric Vehicle Battery Systems is a unique book on electric vehicle thermal management systems for researchers and practitioners in industry, and is also a suitable textbook for senior-level undergraduate and graduate courses.

Advanced Battery Management Technologies for Electric Vehicles

Public science and private innovation

Technical Innovation in American History: An Encyclopedia of Science and Technology [3 volumes]

Inside Electric Cars

Principles and Applications with Practical Perspectives

Electric Vehicle Battery Systems

A Soul of a New Machine for our time, a gripping account of invention, commerce, and duplicity in the age of technology A worldwide race is on to perfect the next engine of economic growth, the advanced lithium-ion battery. It will power the electric car, relieve global warming, and catapult the winner into a new era of economic and political mastery. Can the United States win? Steve LeVine was granted unprecedented access to a secret federal laboratory outside Chicago, where a group of geniuses is trying to solve this next monumental task of physics. But these scientists— almost all foreign born—are not alone. With so much at stake, researchers in Japan, South Korea, and China are in the same pursuit. The drama intensifies when a Silicon Valley start-up licenses the federal laboratory ' s signature invention with the aim of a blockbuster sale to the world ' s biggest carmakers. The Powerhouse is a real-time, two-year thrilling account of big invention, big commercialization, and

big deception. It exposes the layers of competition and ambition, aspiration and disappointment behind this great turning point in the history of technology.

Fully updated throughout, Electric Vehicle Technology, SecondEdition, is a complete guide to the principles, design andapplications of electric vehicle technology. Including all thelatest advances, it presents clear and comprehensive coverage ofthe major aspects of electric vehicle development and offers anengineering-based evaluation of electric motor scooters, cars,buses and trains. This new edition includes: important new chapters on types of electric vehicles, includingpickup and linear motors, overall efficiencies and energyconsumption, and power generation, particularly for zero carbonemissions expanded chapters updating the latest types of EV, types ofbatteries, battery technology and other rechargeable devices, fuelcells, hydrogen supply, controllers, EV modeling, ancillary systemdesign, and EV and the environment brand new practical examples and case studies illustrating howelectric vehicles can be used to substantially reduce carbonemissions and cut down reliance on fossil fuels futuristic concept models, electric and high-speed trains anddevelopments in magnetic levitation and linear motors an examination of EV efficiencies, energy consumption andsustainable power generation. MATLAB ® examples can be found on the companion website ahref="http://www.wiley.com/go/electricvehicle2e"www.wiley.com/go/electricvehicle2e/a Explaining the underpinning science and technology, this book isessential for practicing electrical, automotive, power, control andinstrumentation engineers working in EV research and development.It is also a valuable reference for academics and students inautomotive, mechanical, power and electrical engineering.

Long Hard Road: The Lithium-Ion Battery and the Electric Car provides an inside look at the birth of the lithium-ion battery, from its origins in academic labs around the world to its transition to its new role as the future of automotive power. It chronicles the piece-by-piece development of the battery, from its early years when it was met by indifference from industry to its later emergence in Japan where it served in camcorders, laptops, and cell phones. The book is the first to provide a glimpse inside the Japanese corporate culture that turned the lithium-ion chemistry into a commercial product. It shows the intense race between two companies, Asahi Chemical and Sony Corporation, to develop a suitable anode. It also explains, for the first time, why one Japanese manufacturer had to build its first preproduction cells in a converted truck garage in Boston, Massachusetts. Building on that history, Long Hard Road then takes readers inside the auto industry to show how lithium-ion solved the problems of earlier battery chemistries and transformed the electric car into a viable competitor. Starting with the Henry Ford and Thomas Edison electric car of 1914, it chronicles a long list of automotive failures, then shows how a small California car converter called AC Propulsion laid the foundation for a revolution by packing its car with thousands of tiny lithium-ion cells. The book then takes readers inside the corporate board rooms of Detroit to show how mainstream automakers finally decided to adopt lithium-ion. Long Hard Road is unique in its telling of the lithium-ion tale, revealing that the battery chemistry was not the product of a single inventor, nor the dream of just three Nobel Prize winners, but rather was the culmination of dozens of scientific breakthroughs from many inventors whose work was united to create a product that ultimately changed the world.

Large-scale integration of renewable energy in the electricity grid creates issues such as intermittency and lack of load and peak matching. Battery storage and nuclear energy are both low-carbon options that can supplement variable electricity generation and will be necessary for large-scale renewables deployment. However, with changes in resources and technology, it is important to anticipate future issues that might arise with these energy options to ensure the low cost and carbon footprint of electricity. In this dissertation, the main aim is to conduct a prospective life-cycle assessment (LCA) of second-life electric vehicle batteries (SLBs) as energy storage and uranium extraction for nuclear energy in the US, to identify and mitigate unintended consequences.Current battery technologies, in particular lithium-ion batteries, are expensive and can increase the carbon footprint of the grid due to charge-discharge losses. A possible cheaper and greener alternative for energy storage is remanufactured SLBs that have reached end-of-life (EOL). With the increase in electric vehicle (EV) sales, a large number of batteries are expected to reach EOL in the near future. Although SLBs can have 70 to 80% of remaining capacity, it is unknown whether they will perform at par with new batteries in various applications. It is also unknown whether SLBs provide cost and carbon emission reduction compared to new batteries, nor is there any information on SLB demand. Accelerated life testing was conducted on EOL EV battery cells to assess their performance in residential energy storage, commercial fast-charging, and utility-level peak shaving applications. A LCA and an economic evaluation were conducted to calculate the life-cycle carbon footprint and levelized cost of electricity of using SLBs and new batteries in the above-mentioned applications. A system dynamics model was developed to compare the cost, carbon footprint, and material requirement of EV battery recycling and remanufacturing in the US from 2017 to 2050. Residential energy storage performed the best during the accelerated life testing of battery cells. SLB use instead of new batteries can reduce the levelized costs and carbon footprint for all three applications. Remanufacturing reduced the life-cycle carbon footprint of batteries by 2 to 16% compared to recycling only. The economic value of remanufacturing is expected to decrease over time with the decreasing price of new batteries, necessitating policies that can incentivize SLB uptake, given that the SLB market is still emerging.In contrast, nuclear energy is a mature technology in use since the 1950s. Over time, uranium ore grades have decreased globally, and open-pit and underground mining methods are being replaced by in-situ leaching (ISL)—alkaline and acidic. Alkaline ISL is most prominent in the US and is promising for many recently discovered uranium deposits. As future uranium mines can be expected to use alkaline ISL, assessing its environmental impacts is necessary to assess those of future nuclear power plants in the world. Currently, there is no environmental LCA for alkaline ISL. We performed the first LCA of alkaline ISL in the US for extracting US-based uranium ores of grade 0.036 – 0.4% U3O8. The alkaline ISL carbon footprint was found to be almost twice those reported for acidic ISL, but lower than open-pit and underground methods. The results indicate a risk of increasing the carbon footprint of future nuclear energy generation. Similarly, the results for SLB-based applications show lower cost and carbon emissions compared to new batteries. It is important to identify anticipated future changes in resources or technology and include them in the present-day sustainability analysis of electricity generation. Prospective life-cycle assessment is, thus, a key analysis tool to analyze various low-carbon energy options to ensure the low cost and environmental impacts of electricity generation today and in the future.

Materials and Electrochemistry

Battery Management Systems of Electric and Hybrid Electric Vehicles

Bottled Lightning

Inside the Invention of a Battery to Save the World

In 1990, the Electric and Hybrid Propulsion Division of the US Department of Energy established its ad hoc EV Battery Readiness Working Group to identify regulatory barriers to the commercialization of advanced EV battery technologies and facilitate the removal of these barriers. A Shipping Sub-Working Group (SSWG) was formed to address the regulatory issues associated with the domestic and international shipment of these new battery technologies. The SSWG invites major industrial developers of advanced battery technologies to join as members and work closely with appropriate domestic and international regulatory authorities to develop

suitable regulations and procedures for the safe transport of these new battery technologies. This paper describes the domestic and international regulatory processes for the transport of dangerous goods; reviews the status of shipping regulations for sodium-beta and lithium batteries; and delineates the lessons learned to date in this process. The sodium-beta battery family was the first category of advanced EV batteries to be addressed by the SSWG. It includes both sodium/sulfur and sodium/metal chloride batteries. Their efforts led to the establishment of a UN number (UN 3292) in the UN Recommendations, for cold cells and batteries, and establishment of a US Department of Transportation general exemption (DOT-E-10917) covering cold and hot batteries, as well as cold cells. The lessons learned for sodium-beta batteries, over the period of 1990--94, are now being applied to the development of regulations for shipping a new generation of lithium battery technologies (lithium-polymer and lithium-aluminum/iron sulfide batteries).