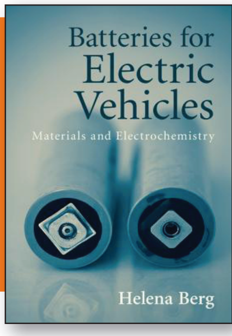


Batteries for Electric Vehicles: Materials and Electrochemistry
Helena Berg
Cambridge University Press, 2015
250 pages, $99.99 (e-book $80.00)
ISBN 9781107085930

This book is a guide to batteries used in electric vehicles. The strength of the book lies in its simplicity and clarity. Its audience is beginning researchers and those in industry seeking practical information and guidance in the design of batteries for electric vehicles. Unburdened by heavy data, the book illustrates many concepts using only schematic diagrams that are relevant to a wide range of batteries and show general trends.

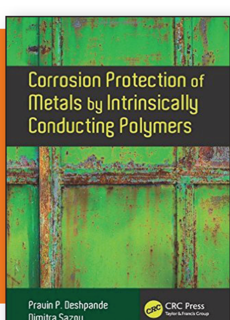
The book is divided into three major parts: basics, lithium-ion batteries, and battery usage in electric vehicles. Part I, consisting of two chapters, benefits from the author's academic background. The first chapter explains cell components and electrochemistry. The explanation of typical discharge profiles as a practical application of Gibbs phase rule is an example of the author's approach. These fundamentals are linked to materials in the second chapter, which briefly describes eight battery types: lead-acid, nickel metal hydride, lithium, high-temperature molten, nickel-zinc, zinc-air, metal-ion, and redox flow. Supercapacitors and fuel cells are also included in this chapter.

Part II has an extended chapter on lithium battery materials and another chapter on cell design. The author makes use of her industrial background in describing how cells are designed for energy or power, the tradeoffs involved, and how performance depends on particle size, porosity and thickness of electrodes, and on the type of cell—cylindrical, prismatic, or pouch. She succinctly describes the manufacturing process of lithium-ion cells.

Part III considers the specific battery requirements at different levels of electrification—all electrics, hybrids, and plug-in hybrids. The battery contains not only cells, but also a thermal system, electronics, and a management system. These are described in chapters 5 and 6 from a design point of view with clear terminology and a glossary in the appendix. The degradation of the battery due to loss of cyclable lithium and of active electrode material, nonoptimal cycling, temperature outside the design range, overcharge, and overdischarge and current rate are discussed in chapter 7. Degradation mechanisms of lithium-ion cells and methods of failure analysis are also discussed.

This book is recommended as supplementary reading in a senior undergraduate or graduate-level course and as a primer on design and for getting practical information on batteries for electric vehicles. There are no homework exercises and only eight references in the entire book; therefore, it may not serve as a textbook in spite of its clarity. However, it achieves its intended purpose of enabling the reader to make informed choices to optimize battery performance.

***Reviewer: N. Balasubramanian** works in the area of ultrafine-grain materials, energy storage, and materials innovation in Bangalore, India.*



Corrosion Protection of Metals by Intrinsically Conducting Polymers
Pravin P. Deshpande and Dimitra Sazou
CRC Press, 2015
214 pages, $159.95 (e-book $111.97)
ISBN 9781498706926

Corrosion of metals is an electrochemical process of degradation that occurs in the atmosphere with an annual cost estimate of tens of billions of dollars amounting to about 1–3% of the gross national product in developed countries, such as the United States and the United Kingdom. A variety of methods available for metal protection are dependent on the nature and environment of the metal. This book deals with the use of conducting polymers (CPs) as a novel method for corrosion protection.

The book is divided into seven chapters, with chapter 1 giving an overview of the developments in anticorrosion technology that has evolved using conducting polymers. In this chapter, there is a historical introduction to the discovery of conducting polymers by H. Shirakawa, Alan J. Heeger, and Alan G. MacDiarmid that resulted in a Nobel prize. The chemical structures and conductivities of CPs such as polyaniline, polypyrrole, polythiophene, poly(para-phenylene vinylene), and polycarbazole are discussed, as well as charge transport in these CPs based on solitons, polarons, and bipolarons. The next few pages contain examples of applications of CPs, a brief introduction to corrosion of metals and the methodology for its prevention, chromate-based anticorrosive coatings, and the occupational health hazards associated with chromates. Subsequent material focuses on smart green, self-repairing coatings explained through diagrams. This chapter concludes with a summary of possible mechanisms by which CPs can protect metals against corrosion. Chapter 2 includes the principles of