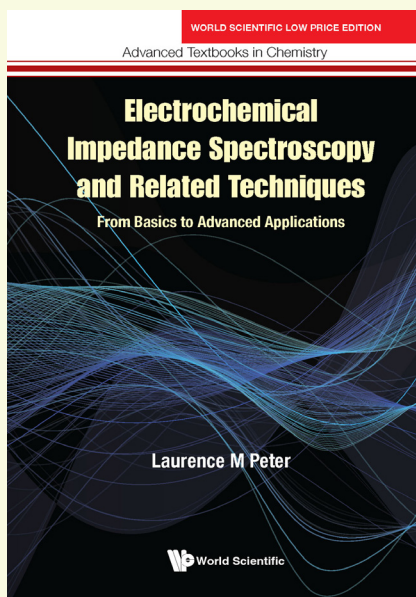


Electrochemical Impedance Spectroscopy and Related Techniques

From Basics to Advanced Applications



By **Laurence M Peter**
(University of Bath, UK)

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ABOUT THE BOOK

This book begins by introducing the basic concepts of impedance to non-specialist readers, who may have only an elementary knowledge of physics and mathematics. Mathematical concepts are explained clearly at appropriate points in a series of Theory Notes. Subsequent chapters cover RCL (resistor, capacitor, inductor) circuits before developing the key ideas behind the application of impedance spectroscopy to electrochemical systems. Circuit elements used to model electron transfer, double-layer charging and diffusion are described in detail, along with Kramers–Kronig testing of experimental data. The book explains how potentiostats and frequency-response analyzers work and evaluates a wealth of experimental data obtained either during the annual Bath impedance courses or in the laboratories of the author and his colleagues.

Topics covered include not only conventional electrochemical systems, such as the rotating disc electrode and ultramicroelectrodes, but also unconventional solar cells and the application of frequency-resolved techniques in spectroelectrochemistry. Finally, the last two chapters introduce techniques based on modulation of light intensity rather than voltage or current. The book concludes with worked answers to the problems set out in earlier chapters.

READERSHIP

Postgraduate students and professionals in the industries of chemistry, physics, materials science. Adoption by Courses: EIS Course at Bath.

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- Getting Started
- Frequency-Response Analysis
- Putting the E in EIS: Frequency-Response Analysis of Electrochemical Systems

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- The Potentiostat and the Frequency-Response Analyzer: How Do They Work?
- Examples of Finite Diffusion Impedance: The Rotating Disc Electrode and the Ultramicroelectrode
- Photoelectrochemical Impedance Spectroscopy of Dye-Sensitized Solar Cells and Metal Halide Perovskite Cells
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- Intensity-Modulated Techniques: Application of IMPS and IMVS to Characterize Unconventional Solar Cells
- Applications of IMPS and PEIS to Study Photoelectrode Kinetics

ABOUT THE AUTHOR

Laurence M Peter is Emeritus Professor at the University of Bath. Following receiving PhD from the University of Southampton, he worked for four years in the research group of Professor Heinz Gerischer at the Max Planck Institute in Berlin Dahlem. Following his return to the UK, he built up a research group at the University of Southampton that focussed on semiconductor electrochemistry. During this period, he developed some of the advanced frequency-resolved techniques that are described in this book. After moving to Bath, he started the annual course on electrochemical impedance spectroscopy that has been running now for around 30 years. His experience running this course and meeting a wide range of attendees has been distilled into the first half of this book, which introduces electrochemical impedance spectroscopy to a non-specialist audience. The second part of the book builds on the hundreds of scientific papers that Peter has published, which deal with the extension of frequency-resolved techniques to optical and photoelectrochemical systems.

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