

## Spectroelectrochemistry, W. Kaim, A. Klein, Eds., The Royal Society of Chemistry

Cambridge, 2008, X + 236 p., 106.47 €, ISBN 978-0-85404-550-1

Rudolf Holze

Received: 27 March 2009 / Accepted: 27 March 2009 / Published online: 18 April 2009  
© Springer-Verlag 2009

Twenty years (and not 28 as erroneously claimed on p. 229 of this book) have passed since the last book with exactly the same title [*Spectroelectrochemistry* (R.J. Gale Ed.) Plenum Press, New York 1988] has been published. Although this first attempt to cover a rapidly developing field encompassing a still growing number of spectroscopic and related analytic methods preferably *in situ* to electrochemical challenges had already been marred by the fact that a rather disjointed collection of reviews by authors apparently not communicating with each other in the attempt to provide a coherent description—the reader looked in vain for sort of a guide and selection assistance when confronted with a particular problem—resulted and was thus disappointing, a second attempt to tackle this request for a guidebook might be worthwhile.

There are certainly various approaches to the task: Try to provide an overview as complete as possible without particular attention to a selected area of methods or to a subfamily of methods, try to cover a certain family of substances (something like spectroelectrochemical materials science), or try a combination arriving essentially at an arbitrary mix of method—and substance-devoted contributions—actually a collection of personal perspectives on spectroelectrochemistry. Unfortunately, the editors have chosen the last approach.

In seven chapters, aspects of spectroelectrochemistry and the application of spectroscopies in various areas of current research preferably in organometallic and coordination chemistry are treated. The first one by Best, Borg, and Vincent starts promisingly with the title *Infrared Spectro-*

*electrochemistry*. In a fairly systematic approach, experimental setups are described rich in detail (very helpful to anybody pondering a cell construction for his particular spectrometer and chemistry) followed by again a well-organized overview of applications. The second chapter by Dhungana and Crumbliss attempts (with considerably less impressive result) the same task for UV-Vis spectroscopy. The overview of experimental techniques is rather incomplete (for unknown reasons, it is limited to thin-layer cells with optically transparent electrodes, only wire mesh electrodes are mentioned, neither internal nor external reflection are even mentioned) and will be of only limited value. Somewhat surprisingly, a section on “Mediator” is placed besides the section on “Optically transparent thin-layer cells.” Closer inspection reveals that mediators are sometimes used in the particular protein research of the authors—and this is exactly the subject of the remaining chapter. An overview of UV-Vis spectroelectrochemistry may look differently.

Chapter three tackles the book’s subject from an entirely different angle, entitled “Mixed-valence intermediates as ideal targets for spectroelectrochemistry (SEC)” (sounds like the description of a solution searching for a problem) by Kaim, Sarkar, and Lahiri. Starting with a problem, better understanding of mixed valence compounds, the authors briefly touch upon several spectroscopies potentially useful to tackle this challenge. Numerous examples from the borderline between organic and coordination chemistry are discussed in detail with respect to observed features in cyclic voltammograms and results of various spectroscopies. Their assignment to particular features of the studied compounds will be particularly helpful for the novice.

“Spectroelectrochemistry of metalloporphyrins” by Klein is presented in Chapter 4. Basically, the same methods as in the previous chapter are applied, and again, experimental

R. Holze (✉)  
Institut für Chemie, Technische Universität Chemnitz,  
Chemnitz 09107, Germany  
e-mail: rudolf.holze@chemie.tu-chemnitz.de

details are missing. At best, this contribution may be considered a minireview of one method-related aspect of metalloporphyrins. Chapter 5 by Salsman and Kubiak turns back to the subject of Chapter 3 (mixed-valence complexes) and the methods of Chapter 1 (infrared spectroelectrochemistry). Starting with the description of a temperature-controlled spectroelectrochemical cell for external reflection as an important addendum to the rather limited experimental part of ch. 2 mostly publications by the senior author are reviewed. A brief glimpse onto resonance Raman spectroscopy turns out to be of limited scope only. Excitation was provided by laser light at the long wavelength end of the visible spectrum (approaching near-infrared excitation) matching one of the several absorptions assigned to electronic transitions. Description of the experimental setup is brief but adequate (provided the reader knows that only solution phase species were studied).

The seventh chapter by R.F. Winter again starts with the time-worn statement "...spectroelectrochemistry has emerged as a powerful tool..." and goes on with an overview of spectroelectrochemical studies of carbon-rich organometallic compounds. The methods already well-known in the book are applied once more. Electron spin resonance spectroscopy is used repeatedly without giving any experimental detail; this has been the case already in Chapters 3 and 4. However, help is on the way. The final Chapter 7 by Murray and Yellowlees starts with a description of the cell used by the authors in their *in situ* studies. At least an attempt is made to provide sort of an overview of experimental alternatives; however, without

any illustration, the imagination of the reader is stretched considerably, and unfortunately, the overview is rather incomplete. Examples include (presumably as demonstration) nitrobenzene and several other purely organic compounds (apparently somewhat outside of the book's focus) and platinum and ruthenium complexes. At the end, purification of the employed solvents, electrolyte salts, and metal complexes is described—in a book of this type a somewhat unusual feature.

The book is carefully prepared; numerous equations, schemes, and figures have been prepared with attention to even minor details. Only in some cases, figures of poor resolution appear (apparently scanned using dated plots and schemes on paper), which rarely result in confusion of the reader. A reader looking for a systematic overview of spectroelectrochemical methods will put aside the book with disappointment. It lacks a systematic approach, contains chapters prepared with apparently rather different visions of the book in mind and focusing in several cases on the personal interests of the authors instead of the potential readers. Some introductory sections containing indeed helpful practical information are buried in a lot of very special stuff. Scientists interested in progress of selected spectroscopic methods as applied to rather particular parts of inorganic, coordination chemistry, and biochemistry may find the content helpful. Whether they will search for this in a book with this title is another question. Nevertheless, the book can be recommended for libraries of research institutions where basic spectroscopic tools are employed in these areas of chemistry.