

Rudolf Holze

**C.G. Vayenas, B.E. Conway, R.E. White. M.E. Gamboa-Adelco (eds):
Modern aspects of electrochemistry, vol. 36**

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As the most recent volume of a successful series established in 1954 and carefully continued, this book provides a timely collection of review papers covering all aspects of electrochemistry with representative contributions. From the field of spectroelectrochemistry P.K. Babu, E. Oldfield and A. Wieckowski provide an overview of electrochemical nuclear magnetic resonance spectroscopy applied to nanoparticle surface studies. The broadening application of theoretical chemistry concepts and methods in interfacial chemistry including electrochemistry is represented by a contribution from M.T.M. Koper on *ab initio* quantum-chemistry calculations in electrochemistry. Adsorption phenomena—one of the earliest subjects of interfacial electrochemistry—are treated with various modelling approaches by P. Nikitas. The electrochemical promotion of catalysis is reviewed by G. Fóti, I. Bolzonella and C. Comninellis. Closely related to electrocatalysis is electrochemical energy conversion, an area represented by a contribution from H.-C. Shin and S.-I. Pyun on lithium ion transport in transition metal oxides.

The use of NMR spectroscopy in electrochemistry is still an emerging technique pioneered by A. Wieckowski and his group (as recently honoured by the Electrochemical Society with the D.C. Grahame award of the Electrochemical Society 2003), and is not very broadly applied because of the considerable requirements of both experimental skills and equipment. Adding to various recently published reviews mainly from this group, the investigation of nanoparticles—particularly interesting for electrochemical applications in, e.g., fuel cells—is covered here. Not surprisingly, studies of ^{195}Pt (on the electrode side) and ^{13}C (on the solution side as constituent of most fuels and some ions, too) are within

the focus of the contribution. The review covers both fundamental and experimental aspects broadly enough to give an understanding of method and results without being forced to search further sources.

The use of models and methods from theoretical chemistry is of growing importance in many fields of electrochemistry, ranging from the fundamental understanding of double-layer phenomena to the tailoring of advanced electrocatalysts. Koper provides an overview of the fundamentals used in these applications and illustrates the practical value in examples from interfacial electrochemistry (chemisorption of halides), spectroelectrochemistry (CO adsorption and Stark effect) and electrocatalysis (chemisorption of water, water dissociation and modeling of electrode reactions).

Nikitas reviews models used in the understanding of electrosorption phenomena. Particular attention is paid to complications like co-adsorption, reorientation, surface segregation and phase transitions.

Electrochemical promotion of catalysis (also popular as the NEMCA effect) is carefully reviewed with attention to experimental aspects of mechanistic studies. Some details of conceivable industrial applications in bipolar cells are included. The researcher interested in this field will appreciate the inclusion of fundamental aspects.

Transition metal oxides are of considerable importance, especially for high-power secondary lithium batteries. Starting with the frequently reported claim, that lithium diffusion in these solids is very slow whereas other steps of lithium ion transport in a cell are too fast to affect overall kinetics the authors carefully review experimental evidence from various methods, in particular from current transient measurements. In conclusion, Shin and Pyun state that the transient behavior of these secondary batteries is controlled by cell impedance, and not solely by slow diffusion.

The book is carefully prepared, although unfortunately quite a few figures, presumably converted

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digitally by inadequate means, are of rather poor, and in some cases, of almost illegible quality. The editor should resist the temptation to simply convert figures via software without looking carefully at the quality of the final product. Some loss of symbols in the chapter on electrochemical promotion of catalysis may also be due to

an unlimited belief in the infallibility of editing software. Despite these really quite minor weaknesses, the book is a must for all libraries already owning previous volumes, while the contributions on NMR spectroscopy, theoretical chemistry and catalysis justify acquisition for those entering these fields.