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BOOK REVIEWS

Electrochemistry of Immobilized Particles and Droplets. By Fritz Scholz, Uwe Schröder (Universität Greifswald, Germany), and Rubin Gulaboski (Universidade do Porto, Portugal). Springer: Berlin, Heidelberg, New York. 2005. xiv + 290 pp. $129.00. ISBN 3-540-22005-4.

This is a highly specialized book that attempts to provide a unifying framework for the treatment of the electrochemistry of immobilized particles and immobilized droplets on electrode surfaces. Although the material covered is interesting, much of the attention was focused on electroanalysis, an area in which the main author, Scholz, is indisputably an expert. This reviewer particularly enjoyed the vastly qualitative information obtained from art specimens, although it is doubtful that electrochemical techniques could compete with more modern methods of analysis such as X-ray photoelectron spectroscopy or atomic absorption. Because of the overemphasis on electroanalysis, other topics that would normally fall squarely under the title of the book were not given the prominence they deserve. Notably limited was the discussion of immobilized particles in fuel cells (e.g., Pt nanoparticles supported on high area carbon) and lithium ion battery electrodes (e.g., micrometer-size carbon and transition metal oxide particles mixed with carbon and a binder), which in the opinion of this reviewer represent perhaps the most important examples of genuine immobilized particles in electrochemical technology today. As noted by the authors, the complexities associated with the presence of "reactive" three-boundary phase interfaces do pose serious challenges toward the quantitative interpretation of electrochemical data, including volume changes and moving boundaries. Further complexities are derived from the dependence of the particle shape and the area of contact with the current collector on the temporal behavior of the profiles of relevant species. In fact, solutions to such systems can only be obtained through numerical simulations, with only a few notable exceptions. The authors should have stressed that, in many instances, it is not necessary to perform experiments employing immobilized particles (or droplets) to extract meaningful data regarding such aspects as solid-state transport and electron and ion transfer rates at interfaces, should that be the desired aim of the studies. In fact, as only too briefly touched upon by the authors, experiments involving thin layers of electroactive materials (e.g., Prussian blue and its derivatives) can provide exceedingly valuable information regarding some of these issues without the complexities associated with three-phase boundaries. Also disappointing was the brief and largely incomplete summary review of in situ techniques applicable to immobilized particles, which ignored the great progress achieved using synchrotron radiation methods including EXAFS, NEXAFS, and diffraction.

In stark contrast to the direct technological relevance of immobilized solid particles, there are very few technical systems that involve electroactive immobilized droplets. One notable exception would be the ingenious use of rotating microdroplets by Gratzl at Case Western Reserve University (Cserey, A.; Gratzl, M. Rotating Sample System: An Equivalent of a Rotating Electrode for Microliter Samples. *Anal. Chem.* **1997**, *69*, 3687–3692). Nevertheless, despite its shortcomings, this book should provide those interested in the area with enough background information to become acquainted with major developments in the subject matter.

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