

148 Topics in Current Chemistry

Electrochemistry III

Editor: E. Steckhan

With Contributions by

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With 7 Figures and 22 Tables



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This series presents critical reviews of the present position and future trends in modern chemical research. It is addressed to all research and industrial chemists who wish to keep abreast of advances in their subject.

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Preface to the Series on Electrochemistry

The scope of electrochemistry having broadened tremendously within the last ten years has become a remarkably diverse science. In the field of electroorganic synthesis, for example, selectivity has been improved by use of electrogenerated reagents, energy uptake lowered and space-time yields have been improved by using mediated reactions. In addition, electroorganic chemistry has been efficiently applied to the synthesis of key building blocks for complex molecules and has established its role as a new tool in organic synthesis. However electrochemistry has also found new and interesting applications in quite different fields of chemistry. Photoelectrochemistry, as one example, is not only valuable for transformations of organic molecules but also for the very important goal of energy conversion. More insight has been gained in the processes occurring on illuminated semiconductor electrodes and micro particles. Designing the composition of electrode surfaces can lead to the selective activation of electrodes. Electrochemical sensors and techniques present new opportunities for the analysis of biological compounds in medicine and biology. Research in the field of conducting polymers is very intensive because of interesting potential applications.

Therefore I am very happy that Springer-Verlag has decided to account for these important developments by introducing a series of volumes on new trends in electrochemistry within its series Topics in Current Chemistry. The volumes will cover the important trends in electrochemistry as outlined above in the following manner:

Electroorganic Synthesis by Indirect Electrochemical Methods;
New Applications of Electrochemical Techniques;
Recent Development in Electroorganic Synthesis.

The guest editor is very happy and thankful that well-known experts who are actively engaged in research in these fields have agreed to contribute to the volumes. It is hoped that this collection of reviews is not only valuable to investigators in the respective fields but also to many chemists who are not so familiar with electrochemistry.

Preface to Volume III

At this rather advanced stage of research and application, I think, it is very appropriate to devote Volume III and part of Volume IV of the electrochemistry series in Topics in Current Chemistry to **recent developments in electroorganic synthesis**. The basis for modern electroorganic synthesis was laid down during the 1960's and 70's by the discovery of the principal reaction mechanisms and by the introduction of a number of industrial processes. Now, electrochemists are in a position in which they can select from an abundance of methodological tools to synthesize complex organic building blocks and target molecules.

This is nicely demonstrated by two contributions to this volume. On one hand, electrochemical strategies for the synthesis of complex bioactive alkaloid structures are developed, and on the other, the electrochemical transformation of readily available bio-molecules (terpenoids and β -lactams) into enantiomerically pure complex synthetic building blocks is demonstrated.

In one paper, a new methodology for the remarkably selective reduction of organic molecules, possessing very negative reduction potentials, is developed. Due to the relatively simple reaction conditions, this method may be an interesting alternative to alkali metal-ammonia reductions.

A tremendous amount of research in the field of electroorganic synthesis has been performed in industrial laboratories. This work usually is only accessible with difficulty because it is hidden in patents. Therefore it is extremely helpful for scientists working in this field that an industrial electrochemist undertook the burden of critically reviewing the patent literature. At the same time the prospects and limitations for future industrial applications of electroorganic syntheses are clearly evolved.

It is hoped that the contributions to this volume will fruitfully influence the further development of electroorganic chemistry and initiate a growing interest in the application of electrosynthetic methods.

Bonn, April 1988

Eberhard Steckhan

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