

## Book Review

**Electrochemistry in Organic Synthesis.** By J. Volke; F. Liska. Springer: Berlin, 1994, 153 pp, hardback. DM 98. ISBN 3-540-57533-2.

The authors have produced a concise and well written text book with 200 references on electro-organic synthesis for advanced chemistry students and research chemists. The introductory chapter informs on the advantages of the reagent electron: e.g. less solubility and work-up problems and higher selectivity in comparison with chemical redox reagents, the "Redox"-Umpolung of substrate polarity and the generation of reactive intermediates that are otherwise not accessible.

The chapter "Experimental Factors and Methods of Investigation of Electroorganic Reactions" familiarizes the readers with electrodes, cells, solvent-supporting electrolytes, electroanalytical methods that assist preparative electrolysis (polarography, the rotating disc electrode, cyclic voltammetry) and names precautions for the transfer of these data. Advantages of constant current and constant potential electrolysis are also covered.

The chapter "Reactions of Organic Compounds at Electrodes" constitutes the central part of the book (90 pages). The section "Direct Anodic Oxidations" treats among other subjects the selective oxidation of CH-bonds in alkanes, substitution and addition reactions with olefins, the transposition of functional groups with anodic oxidation as the key step, the cleavage of *vic*-diols and ethers, conversions of sulfur compounds, the cleavage of alkyl halides, nuclear and side chain substitutions of aromatic compounds, the application of anodically generated halogen radicals or cations, the coupling of aromatic amines, the  $\alpha$ -methoxylation of N-alkyl amides to afford versatile reagents for the preparation of substituted amines, the oxidation of carboxylates (Kolbe reaction), Grignard reagents or enolates to radicals for coupling and addition reactions and concludes with addition and polymerization

reactions of furan and pyrrole.

The part on "Direct Reductions at the Cathode" deals with the conversion of functional groups (Birch-type reductions, selective dehalogenation, reduction of nitro compounds, ketones, activated acids and esters), CC-bond forming reactions of cathodically generated anions or radical anions to e.g. pinacols and hydrodimers. Reductive elimination of dihalo compounds to carbenes, strained double bonds, and cyclic compounds, potential selective deprotections of alcohols and double bonds. The succeeding section covers indirect methods. These are oxidations with the nickel hydroxide electrode, substituted trisarylamines and other mediators (Tempo, transition metal ions, halide ions, sulfur compounds).

As indirect cathodic reductions the application of amalgams, Zn,  $\text{Cr}^{2+}$ ,  $\text{Ti}^{3+}$ , vitamin B<sub>12</sub>, polycyclic aromatic compounds and viologens as mediators are described.

The final chapter deals with electrogenerated acids (EGA) from e.g.  $\text{LiClO}_4$  and bases (EGB) from e.g. pyrrolidone, azobenzene or oxygen. They are used in acid catalysed rearrangements, the exchange of substituents, Wittig olefinations, carboxylations or Nef-type reactions. The book presents the essential methods and reactions of organic electrosynthesis with well selected examples. Interspersed are some experimental procedures that demonstrate that the reactions can be performed fairly simply.

There are only few errors in a mostly pleasing arrangement, except for the printing of some formulas. There is a good selection of references, however, recent papers (from 1990 onwards) are not included. The book can be recommended to each graduate student or research chemist who wants to get an overview and instruction to apply electrochemical methods in synthesis.

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