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Book reviews

Organic and Inorganic Low-Dimensional Crystalline Materials (NATO ASI Series B: Physics Volume 168); edited by P. Delhaes and M. Drillon, Plenum Press, 1987, xiii + 482 pages, US $95.00, ISBN 0-306-42783-4.

In the past decade in scientific research there has been an increasing emphasis on interdisciplinary collaboration as a more effective route towards achieving specific goals. Chemists have come to realise their central role in "molecular engineering", tailor-making compounds with predetermined conducting, magnetic and optical properties. However, such an enterprise presupposes their acquaintance with fundamental physical and/or biological concepts. This volume will be of considerable help to them, and derives from the proceedings of a NATO Advanced Research Workshop held in Minorca, Spain in May 1987, as part of the NATO Special Program on Condensed Systems of Low Dimensionality. The workshop, and hence the lecture material, was divided into three sections.

The first part presents the plenary lectures which cover both conducting and magnetic aspects of a variety of low-dimensional materials; there are nineteen such articles in this volume, and these include the solid state crystal chemistry of 1D inorganic chains (J. Rouxel), structures and properties of low-dimensional metal complexes (A.E. Underhill), ligand bridged mixed valency metal chain complexes (P. Day), electronic structure of linear charge transfer solids (Z.G. Soos) insulating magnetic chains (M. Steiner and C.P. Landee), design of molecular ferromagnets (O. Kahn), exotic magnetic systems (C. Benelli et al.), magnetic phase transitions in low-dimensional systems (J.P. Renard), non-linear excitations and quantum effects (K. Kopinga and W.J.M. de Jonge), ferromagnetic exchange in molecular solids (J.S. Miller and A.J. Epstein), theory of the 1D and 2D electron gas (V.J. Emery), anion periodicity and ordering in organic conductors (J.P. Pouget), magnetic properties of Bechgaard salts and related compounds (C. Coulon), molecular metals and superconductors (D. Schweitzer and H.J. Keller), polynuclear metal cluster compounds (L.J. de Jongh), metal cluster active sites in proteins (E.I. Solomon et al.), Langmuir-Blodgett films of donor-σ-acceptor molecules (R.M. Metzger and C.A. Panetta) and potential applications of mixed valency compounds in materials and molecular electronics (J.P. Launay).

The second part covers the poster contributions at the workshop on both magnetic and conducting low-dimensional materials, while the third part deals with the summaries of the round-table discussions on new conducting systems, ferromagnetic compounds, new magnetic materials, competition between (super)conductivity, magnetism and charge density waves and potential technological applications.

The standard of the book is remarkably high, and the editorial work of Delhaes and Drillon excellent. I feel that the primary purpose of the book, i.e. to bring together the physicist's and the chemist's viewpoint of the theory, properties, and applications of low-dimensional materials, is achieved. Furthermore, the potential of

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elegant synthetic work to produce systems with novel properties is rightly emphasized throughout. Of particular interest to the organometallic chemists may be the work of Kahn on the quest for molecular ferromagnets through the synthesis of Mn^{II} Cu^{II} bimetallic systems, and that of de Jongh on polynuclear metal cluster complexes viewed as "zero dimensional" systems.

The book has been produced in camera-ready format and is relatively free from errors. It is probably too expensive for the individual, but essential for all libraries associated with active inorganic chemistry departments.

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Topics in Current Chemistry, Volume 148, Electrochemistry III; edited E. Steckhan, Springer Verlag, 1988, DM148, xii-202 pages, ISBN 3-450-19180-1.

This is the third volume of the Topics in Current Chemistry series to deal with electrochemistry, and its contents reflect the many new departures in this field over recent years. The first and longest section, by Dieter Degner, deals with Organic Electrosynthesis in Industry. There are many problems associated with the applications of electrochemical methods to industrial scale organic synthesis, notably the need for special reactors, difficulties in purification, and the challenges of the continuous operation of a phase boundary reaction. Despite a large number of patents in this area there are few industrially implemented electroorganic processes, but the author foresees that this will change as we move to an era in which environmentally compatible processes are more desirable. The article is in many respects a most unusual one since most of the references are drawn from the patent literature; this is especially valuable, since it is an area which all but the specialist is unlikely to peruse in detail. I was a little disappointed not to find any mention of the new electrochemical techniques for the generation and regeneration of transition metal complexes in catalysis, but perhaps these were not patented.

Organic Electroreductions at Very Negative Potentials is the subject of the second section, by Essie Kariv-Miller, Ryszard I. Pacut and Gaye K. Lehman. These involve studies at the limit of the cathodic "potential window", (-2.7 to -3.1 V (SCE)) using mercury cathodes and tetraalkylammonium electrolytes. Thus preparative reductions of compounds which are inactive within the usual "potential window" have been accomplished. At these very negative potentials the tetraalkylammonium (TAA^+) cation and the mercury cathode combine to form reduced TAA-metal, which is considered to act as the electron transfer agent to the organic substrate. In particular, the reductions of aromatic compounds, alkenes and alkynes and aliphatic ketones are considered. A number of extremely efficient and selective reductions were accomplished, and it seems likely that this field will see many developments in the near future.

Tatsuya Shono's review deals with syntheses of alkaloids which use an electrochemical reaction as a key step. The reactions discussed fall into three groups, oxidative coupling, reactions α to the nitrogen atom of amines, and reductive addition and substitution. The final chapter by Sigeru Torii, Hideo Tanaka and