Paving the Way ...

ADVANCED MATERIALS has made a successful start. In 1989 it will continue to be part of ANGEWANDTE CHEMIE but may be subscribed to separately and will be available in its own specially designed cover,[*] which shows an idealized picture of a microfabricated structure of a kind commonly used in microelectronics. The decision to pave the way for ADVANCED MATERIALS to become a journal in its own right has been made in response to many requests by scientists and engineers from various disciplines other than chemistry, bearing witness to the accuracy of the message conveyed in the first editorial in May last year:

Modern science and technology rely on specialists. Nevertheless, the complexity of many problems is all too often an obstacle to gaining a deeper understanding of physical and chemical phenomena. In particular, the development of advanced materials and new technologies requires the joint efforts of many specialists from a variety of disciplines. The nature of ceramics, polymers, composites and other new materials is such that successful processing must integrate the individual steps of molecular and microstructural design, engineering, testing and manufacturing. The once common distinction between the product, its function in a system, and the material from which it is made has lost its meaning in a context wherein new materials are created on demand to serve special requirements. This implies that a multidisciplinary team of experts is more likely to be successful in the development and application of advanced materials than are individual researchers working within the limits of their special field.

It is always surprising to see that despite the diversity of all the materials in use and under development, the concepts, phenomena and transformations involved in making and using ceramics, metals, polymers and composites are strikingly similar. Important features are phase equilibria, phase transformation mechanisms, defect structures, flow and fracture mechanisms, structures of crystals and glasses and their relationships, internal boundaries and their contribution to macroscopic behavior, the motion or confinement of charge carriers, the statistical mechanics of assemblies of subsystems; these features not only serve to characterize the individual materials in which they were first studied, but also determine the behavior and performance of other materials which at first sight are totally unrelated.

It is this intellectual relationship between the phenomena that are seen in different materials and between the seemingly distinct features that are found in the same material, which has given birth to *Materials Science* as a discipline in its own right. One of the most challenging tasks is to provide the link between the thinking of the chemist who considers materials mainly in terms of structure and dynamics on the atomic and molecular scale and the concepts of the physicist whose models are often based on the continuous nature of matter. Moreover, materials science integrates important aspects of engineering in so far as certain properties of materials arise solely from the process of manufacturing owing to the physical and chemical methods of handling. The latter is most obvious in modern polymer materials where the supermolecular structure of the constituent chain molecules is entirely determined by the processing methods.

Recent years have witnessed an unprecedented explosion of new structural materials. Today the place of technological change due to the availability of more and more specialized high performance materials is rapid. We are only beginning to realize the opportunities provided by the new materials. In addition to changing the engineering landscape, advanced structural materials have also altered traditional policies regarding materials. Historically, national interests in materials have centered around the problem of shortages of supply of certain "critical" ores and minerals. The potential of the new materials such as high performance composites goes far beyond substitution. They provide performance and manufacturing advances which cannot be achieved with traditional metals and they are often the key for new technologies. Therefore, an active governmental role in accelerating the development and commercialization of such materials is seen in all major industrialized countries.

Contents

[*] Illustration & Design, Mannheim, FRG.

ADVANCED MATERIALS

Advanced materials are now ranked together with microelectronics and biotechnology as the most promising "high-tech" industries of the future. With the rise of materials science as a recognizable discipline, many new journals covering different aspects of the field have been founded, all of them publishing either original papers or long, in-depth reviews. In addition, there exist series of books, a plethora of monographs and even an encyclopedia for this new discipline. What the materials community is still lacking is a truly international journal that concomitantly provides stimulating short reviews comprehensible to the many subgroups of the discipline and highly topical short communications that are of interest to more than one discipline; such a journal should also present highlights from the recent original literature, conference reports, book reviews, information about funding programs and materials science institutes, as well as other important news, i.e., all those ingredients that make a journal enjoyable and timely. ADVANCED MATERIALS is intended to serve this purpose.

The program is illustrated best by presenting the authors and titles of the reviews published in the first six issues:

H. Möhwald
Controlling the Microstructure of Monomolecular Layers

J. G. Bednorz, K. A. Müller
Perovskite-Type Oxides—the New Approach to High-T_c Superconductivity (Nobel Lecture)

W. A. Kaysser, G. Petzow
Advanced Materials by Powder Metallurgy

M. T. Reetz
Anionic Polymerization of α-Activated Olefins

J. W. Rabalais et al.
From Carbon Beams to Diamond Films

D. Haarer, A. Blumen
Polymeric Photoconductors—New Concepts

H. Yanagida
Intelligent Materials—A New Frontier

R. Schöllhorn
From Electronic/Ionic Conductors to Superconductors: Control of Material Properties

Z. Yoshida, T. Sugimoto
New Donors of Molecular Organic (Super)Conductors

M. Antonietti
Microgels—Polymers with a Special Molecular Architecture

H. Inokuchi
New Organic Superconductors

Thus ADVANCED MATERIALS covers all aspects of materials science, but especially genuine new materials and methods for their preparation, modification and investigation; important theoretical concepts are also discussed. Attention is always focused on an interdisciplinary approach. The key question is, what does the physicist want to know from the chemist and vice versa, and what do both have to communicate to the materials scientists? ADVANCED MATERIALS is planned to stimulate fruitful discussions and to promote cooperation between scientists from different disciplines.

Finally, it is important to note that ADVANCED MATERIALS now accepts short communications for publication (see Notice to Authors on the following pages). With this addition to the publishing program ADVANCED MATERIALS features

- editorial essays
- short reviews
- short communications
- highlights from the literature ("research news")
- news from the materials science scene
- book reviews
- conference reports
- conference calendar

and serves the needs of a rapidly growing materials science and engineering community. It should help to pave the way for fruitful cooperation.

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