ADVANCED MATERIALS

Editorial

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. It is also a meeting place of constituent sciences. 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 pace of technological change due to the availability of more and more specialized high performance materials is rapid. We are only begining to realize the opportunities provided by the new materials. In addition to changing the engineering landscape, advanced structural materials have also altered

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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.

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 book series, 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 provides stimulating short reviews comprehensible to the many subgroups of the discipline, a journal that presents 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.

ADVANCED MATERIALS will appear again in July and regularly every month from September on as a distinct addition to both the German and English versions of ANGEWANDTE CHEMIE, the traditional chemistry journal that caters to all chemistry subdisciplines. This journal has, of course, published excellent materials related short communications and reviews in the past—take the molecular beam epitaxy article in this issue as an example—and this practice will not be changed.

ADVANCED MATERIALS will cover all aspects of materials science, but especially genuine new materials and methods for their preparation, modification and investigation; important theoretical concepts will also be discussed. The following list of topics gives examples only and is not intended to be complete:

Development of new materials such as

- organic low and high molecular weight materials with novel electrical, optical, and magnetic properties
- polymers with unconventional mechanical properties
- liquid crystals
- thin films
- colloids
- fibers
- composites as structural materials
- composites for dielectric and electrical/electronics applications
- inorganic materials with applicationally interesting properties
- amorphous metals
- high temperature ceramics
- superconducting ceramics
- intermetallics
- catalysts
  multicomponent alloys
- glasses
- biomedical materials
- sensor materials

Developments in new methods of preparation and characterization

- surface and interface characterization and engineering
- plasma assisted polymerization, etching etc.
- laser methods
- electrochemical methods
- spectroscopic techniques of characterization
- diffraction methods
- modern microscopy techniques
- modern casting and powder metallurgical techniques
- powder technology
- nondestructive testing techniques
- materials modeling

An interdisciplinary approach will be emphasized in all contributions. The key question is, what does the physicist want to know from the chemist and vice versa, and what do both have to communicate with the materials scientists? ADVANCED MATERIALS is planned to stimulate fruitful discussions and to promote cooperation between scientists from different disciplines.

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Six editorial advisors (see opposite page), together with Dr. Gölitz, the editor of ANGEWANDTE CHEMIE, and Ligia Dominguez, editorial assistant, will shape ADVANCED MATERIALS. We welcome contributions from all over the world, from academia and from industry, from chemists, physicists and materials scientists, provided they are in keeping with the program outlined in the editorial. Authors who are interested in writing short reviews (up to 15 pages of double-spaced manuscript together with an appropriate number of figures and/or formulas) should contact the editor. Please send all manuscripts and inquiries to:

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