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Advanced Materials in Switzerland

EDITORIAL

Advanced materials are smart, engineered materials whose molecular structure has been designed to achieve high performance that exceeds the corresponding one of conventional, existing materials for structural, electronic, magnetic, photonic, and biomedical applications. They are expected in the 21th century to open up new technological and commercial applications in various industries, including aerospace, automotive, biomedical and biotechnology, electronics, energy, optics, sensorics, and many more. Advanced materials cover a broad spectrum of components ranging from polymers, ceramics, functional organic and inorganic nanostructures, metals, fiber composites and other hybrid compounds and are of interest in a broad range of states, such as crystals, surfaces and interfaces, thin films, and host-guest systems. Consequently, research in advanced materials spans a wide range of scientific disciplines, extending from inorganic, organic, and physical chemists to chemical engineers, to materials scientists, to physicists, and beyond. This is nicely reflected in the diversity of the scientific contributions to this special issue of CHIMIA.

Advanced materials research extends from design to synthesis, to characterization, to the proof of principle of the expected function, to device construction, and ultimately to commercial fabrication. By the nature of this journal and the choice of the guest editor, contributions to this special issue are located more on the chemical side of this wide research field, highlighting in particular the synthesis and characterization of advanced materials. It becomes readily apparent, that supramolecular science, which has seen explosive growth over the past 30 years, has an enormous influence on the synthesis of advanced materials. With templated synthesis, self-assembly and self-organization techniques, or host-guest inclusion, supramolecular chemistry offers fascinating new approaches to molecular and nanoscopic fabrication. The challenging characterization of advanced materials has truly been revolutionized with the arrival of advanced spectroscopies over the past 15 years. These characterization techniques, some of which have been pioneered in Switzerland, include, among others, scanning tunneling microscopy (STM), atomic force microscopy (AFM), scanning electron microscopy (SEM), high-resolution transmission electron microscopy (HRTEM), time-resolved optical and laser spectroscopy, solid-state NMR techniques, and mass-spectrometric techniques such as secondary-ion mass spectrometry (SIMS).

Advanced materials pose special challenges both in education and in research. A highly interdisciplinary approach obviously is mandatory in order to bring a smart new compound from its synthesis into a technological application. Chemists with profound training and expertise in one of the involved specialties who are also well educated to interact productively with

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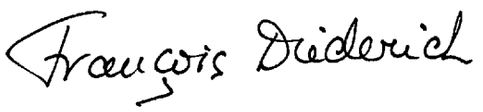
other chemists, materials scientists, and physicists are in high demand. The quality to communicate productively beyond boundaries of fields needs therefore special consideration in the design of new teaching *curricula*. Concentration of research from various disciplines has been encouraged in the United States by the foundation of materials research centers and groups, sponsored largely by the *U.S. National Science Foundation*. Personally, I do not believe that such organizations, requiring extra levels of administration, are recommendable for Switzerland. Advanced materials research in Switzerland already has reached a very high and broad scientific level. For further fertile growth, however, the often historically grown boundaries between institutes and departments at universities and technical institutions need to be significantly reduced. Special multidisciplinary programs and funding initiatives from the *Swiss National Science Foundation* continue to be of particular value to reach this objective.

A search on the world-wide web readily shows that an increasing number of small high-tech and start-up companies in the United States build their portfolio upon advanced materials. It is hoped that we shall see similar developments in Europe in order to boost their fabrication and commercialization. The traditionally strong ties between the large chemical and electronics industry and academic scientists in Switzerland should also be of particular benefit in reaching this objective. Chemistry in the 19th century was dominated by the dye industry and in the 20th century by the polymer and pharmaceutical industries; why not make the coming century that of smart, more efficient and economic advanced materials?



Prof. François Diederich
ETH-Zürich

Prof. *François Diederich* was chosen as coordinating guest editor for the present issue on 'Advanced Materials in Switzerland'. The Editorial Board of CHIMIA would like to warmly thank him for his enormous efforts in planning and successfully realizing this demanding task.