European Networks Focus on Advanced Materials

The European Networks on Advanced Materials were established in 1987 to enhance scientific and technical cooperation between research teams from different countries. With the assistance of industrial and public institutions and with the support of the Council of Europe and the Commission of the European Communities, the European Materials Research Society is continuing to develop these networks. Eleven networks have established programs, and three are in the initial stages of development (see Table).

This article is the last of this past year's on the philosophies, aims and activities of the European networks as described by their chairmen. Featured this month is Network 11 on Electroactive Conjugated Polymers.

A brochure detailing all the networks is available from: P. Siffert, Chairman, European Materials Research Society, Centre de Recherches Nucléaires, 23, rue de Loess, F-67037, Strasbourg, France; telephone 88 28 65 43; fax 88 28 09 90.

Network 11—Electroactive Conjugated Polymers

Chairman: M. Zerbi, Politechnico, Milano, Italy.

During the last decade a new class of organic materials has emerged in chemistry and in physics, the so-called "conducting polymers" or "organic metals." These materials behave as insulators or semiconductors and can acquire metallic conductivity when doped with suitable electron-donating or electron-accepting molecules.

The interest in academic and industrial laboratories is very strong in all technologically developed countries worldwide, and in many universities and national laboratories. These materials are a true challenge for an interdisciplinary community of chemists, physicists, and materials scientists.

Many European groups are very active in this field, which spans theoretical understanding of the phenomenon, the synthesis of new materials, and the search for new devices. Recently, a striking result has been reached with the synthesis of polyacetylene with an electrical conductivity of 10^5 Siemens/cm, similar to the electrical conductivity of copper.

Even though polyacetylene has not yet become a suitable material for technological applications because of its instability, many new materials have been prepared which show good conductivity and high chemical stability. Moreover, some of these materials can be processed for the preparation of conducting films, wires, glasses, and new devices.

Due to the growing importance of this new and exciting field of modern materials, E-MRS has established this network to coordinate and stimulate a collaborative effort on the European level between various laboratories.

Due to the electronic structure of organic molecules, their electrical conductivity involves physical processes completely different from those occurring in metals and even in semiconductors. The theoretical understanding of the mechanism of conductivity at the molecular level is a challenge for those scientists who deal with theoretical physics, solid state physics, physical chemistry, quantum chemistry and computer science. New theoretical aspects have been developed and efforts are being made with computers in molecular engineering to design new molecules which may act as better conductors.

The field of potential applications is in the early stages of development, but a few devices have already reached the level of industrial production, especially in the United States and in Japan.

Mass production is envisaged for the preparation of conductor shields, insulator shields, and shields for discharge-sensitive electronic devices and for the prevention of electromagnetic pollution. Batteries of various sizes and shapes are being manufactured by some companies; electrochromic optical displays and coating of metallic surfaces with conducting polymers as anticorrosion materials are being considered. High-quality materials are being studied for the preparation of Langmuir Blodgett films, for chemical sensors, time-temperature indicators, and drug-release devices. Many industries are interested in the potential application of these substances for optoelectronics and as materials with large nonlinear optical properties.

Although interest in conducting polymers originally developed in the United States and Japan, European countries have readily perceived the relevance and importance of this class of materials for future technology. Several European groups in physics and physical chemistry have contributed to an understanding of the phenomenon and have prepared new materials. The competence and expertise that has developed in Europe is recognized as unique and of a very high level.

Network 11 consists of an interdisciplinary group of experts from several European countries representing the various aspects of fundamental and applied science in this field. Laboratories participating in this network are as follows: Politechnico, Italy; University of Montpellier, France; University of Notre Dame, Belgium; Max Plank Institut für Polymerforschung, Germany; University of Durham, United Kingdom; SIN/RCA, Switzerland; and University of Graz, Austria.

E-MRS Networks on Advanced Materials

Network Number	Theme	Group Leaders
1	Laser chemistry	I.W. Boyd (UK) E.F. Krimmel (FRG)
2	Solid state ionics	M. Balkanski (France)
3	Modeling of solidification	H. Fredriksson (Sweden)
4	Metastable alloy production	J. Bottiger, B. Stritzker, M. von Allmen (Denmark, FRG, Switzerland)
5	Microanalysis of semiconductors	E. Sirtl, A. Cullis (FRG, UK)
6	High energy ion implantation	G.G. Bentini (Italy)
7	II-VI Te-based semiconductors	R. Triboulet (France)
8	Biomaterials	D. Muster (France)
9	Gallium arsenide	H.S. Rupprecht, W. Wettling (FRG)
10	Metal matrix composites	G. Chadwick (UK)
11	Electroactive polymers	M. Zerbi (Italy)

Emerging Networks: Superconducting ceramics, Materials under microgravity, InP and related III-IV materials. □

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