ADVANCED MATERIALS

Conference Reports

Ceramics in Maastricht

By Richard J. Brook *

The combination of a new society and a new conference center brings a special atmosphere to any meeting. This proved true on the grand scale for the first meeting of the European Ceramic Society which was held in Maastricht, Netherlands, over the week 18.–23. June 1989.

The Society itself was founded in 1987 following negotiations between a number of the national ceramic societies in Europe. The coming into existence of the Society was in part prompted by discussions which took place between the American Ceramic Society and representatives of the several European societies at which the need for a coordinating group in Europe was clearly recognized. European colleagues will remember with gratitude the high professional standards which the American Ceramic Society followed in promoting these discussions and in sharing in the ensuing debates; the example of close professional collaboration at the international level afforded by these contacts is a notable and happy one.

The European Ceramic Society currently counts eleven countries among its membership: Belgium, France, Germany, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, the United Kingdom and Yugoslavia. A major role for the new Society will be the organization of the set of conferences which are to continue the tradition established by the Science of Ceramics series. The first such meeting took the form of this conference organized by colleagues from the Netherlands Ceramic Society and the Netherlands Ceramic Federation at Maastricht.

The Maastricht Exhibition and Congress Center is a recently built facility opened in the Netherlands to cater for the holding of exhibitions, conferences, and business functions. The center consists of a group of auditoria, conference rooms, and exhibition halls coordinated into a building which also provides a range of shops, restaurants, cafeterias, hotels, and banks. The general impression is not unlike that given by the best quality of international airport except in that the participants have for the most part a less harassed appearance. The combination of a modern conference center and a neighboring town possessing a highly individual and charming character of the more established kind (open air cafés, tree-lined streets, a friendly and animated population—mostly on bicycles, buildings of high distinction) served to provide an atmosphere eminently suitable for concentrated scientific and technological discussion.

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The meeting itself covered all aspects of the subject of ceramics. Focus was provided by a series of keynote lectures devoted to principal subject areas. These included treatments of basic science (*F. Thévenot*), of engineering ceramics (*F. Thümmler*), of traditional ceramics (*J. E. Enrique*), of electronic ceramics (*L. Cross*), of bioceramics (*G. Heimke*), of standardization (*G. C. Padgett*), and of high temperature superconductors (*S. Horiuchi*). A further plenary session was devoted to a lecture on the subject of microstructures (*R. J. Brook*) given to commemorate the striking contribution made to ceramics science and engineering by Prof. *A. L. Stuijts*. Professor *Stuijts* is everywhere acknowledged as having been a key figure in the development of magneto- and electroceramic materials; his special ability to operate at the interface between industrial applications and academic science served to make him a universally respected colleague, and it is fitting that his name should be associated with a plenary lecture that will form a regular feature at the conferences of the new Society.

The meeting spanned a full week and comprised a mix of technical presentations, of posters, of industrial visits and of exhibits of products from all sectors of the ceramics industry. Despite the length of the meeting, there were occasions when levels of concentration of an almost superhuman character were required on the part of participants (the digestion of 180 posters in parallel with a number of set sessions during a single day). Provision of the industrial visits as a caesura on the Wednesday afternoon gave just the degree of variety required to sustain energies.

In technical matters the meeting covered all aspects of ceramics but, as is common on such occasions, a degree of dominance on the part of the non-traditional ceramics sector could be recognized (the actual distribution of contributions was 180 from basic science, 115 from engineering ceramics, 64 from electrical ceramics, 42 from traditional ceramics, 18 from biological aspects, 27 from superconductors, and 3 from standardization). The integration of such themes within a common discipline will remain an important task for the new Society.

Dutch colleagues are to be congratulated for the imagination and effort which they devoted to the meeting. The assembly of 450 papers, of 80 exhibitors and of 1000 participants into a single professional community within Europe is no easy task; the fact that the meeting gave such a clear impression of a coherent group of participants is in no small part due to the vigor and enthusiasm with which the organizers set about their task. The role of the new Society as it seeks

to define its purpose will in the early stages be largely determined by such milestone events as this conference. The atmosphere of this first meeting was highly encouraging in this regard.

Responsibility for the Society now passes to the German Ceramic Society whose president, Prof. *Hans Hausner*, has succeeded Prof. *Rudi Metselaar* as president of the European Ceramic Society. On the basis of this first meeting one can look forward with confidence to the successor which will be held in Germany in two years time. Those who participated in Maastricht can have been left with little doubt that conferences of the European Ceramic Society will become a regular and respected element in the European materials scene.

Large Area Chromogenics in Gothenburg

By Tord Eriksson *

An international workshop on Large Area Chromogenics took place at Chalmers University of Technology in Gothenburg, Sweden, during a very full day, June 5th. It was organized by CoAT AB, The Center for Materials Science, and Chalmers Industri Teknik under the sponsorship of the Swedish Board for Technical Development. Eight invited researchers lectured on the state of the art of chromogenic materials. 50 invited representatives from industry listened and contributed to the ensuing discussions from, in particular, the applications point of view.

The workshop was opened by Professor *Olaf Meyer*, Head of the Eureka secretariat in Brussels, who gave a very much appreciated lecture entitled "Risk financing of hightech start-ups, especially in international cooperation".

The conference aimed at giving some answers to the following questions. What are the prospects and challenges for chromogenic materials? Where is the frontier in research? What are the applications, and when and how can they be commercially realized?

What is a chromogenic material? The question is certainly relevant since the concept was only recently introduced. The word comes from the greek $\chi\rho\omega\mu\alpha$ = color and $\gamma\varepsilon\nu\varepsilon\sigma\iota\zeta$ = creation. Chromogenic materials change their color – or more general optical properties such as transmission, reflection and absorption – due to an external influence such as applied voltage, incident light, temperature etc. These materials are classified as electrochromic, photochromic, thermochromic and some liquid crystal based materials.

Chromogenic materials could in the future be used to regulate the flow of light and/or solar energy through a window so that a suitable illumination and climatic comfort could be achieved. Other applications for these materials involve large area displays, rear view mirrors for cars, sun roofs etc.

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Professor *Granqvist* gave in his lecture a general insight into the prospects and challenges. A lot of applications sectors can be identified: architectural (energy efficiency, lighting), automotive (energy efficiency, anti-dazzling), aerospace (temperature control), information (displays of various kinds), military (camouflage/chamelionism). Technical problems still have to be solved before any commercialization is feasible. Large modulation of the optical properties is desired in many applications. The durability is sometimes an important requirement (in windows). The material has to be integrated in devices. A challenge of a more non-technical kind is that this technology is very interdisciplinary in nature. This means that, for instance, physicists and electrochemists have to cooperate to achieve an understanding of the coloration mechanism of electrochromic materials.

A lot of basic research has to be done in order to understand the mechanisms behind electrochromism. Dr. *Carl Lampert*, Lawrence Berkeley Laboratory, emphasized some research issues. The materials have to be characterized: optical properties, electrical properties, structure and chemistry, determination of coloration mechanism and overall stability. In addition a number of hitherto neglected materials should be studied. As to the complete devices the following aspects have to be considered: compatible ion storage electrodes, ion conductors for small positive ions such as $Li^{\oplus}$, $H^{\oplus}$, $K^{\oplus}$, polymeric electrolytes for lamination (an all solid state device is desirable), development of fabrication techniques, determination of device operating characteristics and stability testing of prototype devices.

Dr. *N. Lynam*, Donelly Corp., lectured on applications for electrochromic materials. Donelly is producing an electrochromic rear view mirror for cars. The design of such a device differs from that intended for a window in that it is not transparent but reflecting. The materials choice is also simpler since not all layers in the device have to be transparent.