

Strasbourg Hosts 950 at E-MRS Spring Meeting



The European Parliament complex on the canal edge, just a 15-minute stroll from the ancient cathedral of Strasbourg, was host to the biggest European Materials Research Society meeting yet with about 950 attendees.

Five parallel symposia were held from May 29 to June 1, 1990. The symposium on high T_c superconductor materials, the largest symposium, was co-sponsored by the European Physical Society. Four other symposia covered metal matrix composites, magnetic thin films, multilayers and superlattices, metallurgical coatings and materials surface modifications, and surface processing and laser chemistry.

The plenary session was introduced by J.P. Massué from the Higher Education and Research Office of the Council of Europe. Massué discussed recent trends and future plans in this area within and outside Europe, also mentioning future interaction with Eastern European countries. J.G. Wurm discussed the latest funding structures within the BRITE/EURAM program administered by the European Community in Brussels. He also described the initial stages and proposed budgetary levels of the new Framework plan to be initiated in 1991/1992.

Several new developments surfaced during the conference. One of these was the announcement of some 10 E-MRS student awards, presented in front of a large congratulatory audience to students whose work was deemed to be of exceptional quality.

The plenary session featured two world-renowned speakers. Nobel laureate K.A. Müller, from IBM's Zurich Research Laboratory in Switzerland described some wide-ranging perspectives in the field of high T_c superconductors. Prof. A. Mortensen, from the Massachusetts Institute of Technology's Department of Materials Science and Engineering, talked about interfacial phenomena in solidification processing of metal matrix composites.

For the first time, an official equipment exhibition ran in conjunction with the meeting. About 30 companies attended, and the overall response from both attendees and exhibitors was very positive. Similar shows are planned for future E-MRS meetings, also to be held in Strasbourg.

As usual, attendees joyfully sampled the region's gastronomic delights. The now legendary "Parliamentary lunches" were supplemented once again with a conference banquet and trip to an Alsace wine

producer in Barr, just outside Strasbourg.

The proceedings of symposia A and E have already been published by Elsevier North-Holland, Symposium A in camera-ready form and Symposium E the journal, *Applied Surface Science*. Proceedings from the three remaining symposia will be published in early to mid-1991.

The upcoming E-MRS Spring meeting (May 27-31) will feature five symposia. Running concurrently and at the same Strasbourg venue with the E-MRS Spring Meeting will be the International Conference on Advanced Materials, co-sponsored by E-MRS, MRS, the Materials Research Society of India, the Materials Research Society of Japan, and the International Union of Materials Research Societies. For more details about these two meetings, see the Calendar section of this issue and p. 61-62 in the January 1991 MRS BULLETIN.

Ian W. Boyd

High T_c Superconductor Materials (Symposium A)

Chairs: H-U. Habermeier, Max-Planck-Institute für Festkörperforschung (Germany) and E. Kaldis, ETH Zurich (Switzerland).

The rapid development of high-temperature superconductivity in the last three years has shown the importance of materials research, not only for applications, but primarily for understanding the underlying physical phenomena. The discovery of new superconductors has opened up new facets of high T_c research, and the perfection of already known materials has enabled us to perform reliable physical measurements. Only such measurements, performed on materials as perfect as possible, can be used as a basis for theoretical models.

Immediately after Bednorz and Müller's brilliant discovery, E-MRS started its symposia on superconductivity, holding the first in May 1987 and the second in November 1988. This symposium, the third one with 500 participants from 23 countries, 260 submitted abstracts, and 210 submitted papers, showed a 100% increase in the number of attendees and submitted abstracts compared to previous symposia.

The highlight of the symposium was the plenary lecture by Nobel laureate K. Alex Müller. He presented an interesting overview of recent developments in the field and pointed out the importance of apical oxygen phenomena, which experiments show are strongly connected with changes in T_c .

Several invited papers, particularly in the emerging materials sessions, discussed the same subject. Anomalies in the lattice parameter dependence on oxygen content of $YBa_2Cu_3O_x$, helped to interpret the pressure dependence of T_c and its relationship to changes of the apical bond. Extensive neutron diffraction measurements at normal and high pressures in $YBa_2Cu_3O_7$, $YBa_2Cu_4O_8$, and $Y_2BaCu_7O_{15}$ summarized in these sessions, showed the importance of the apical bond. Other highlights included the discovery of a new high T_c superconductor, finding an increase of T_c for $YBa_2Cu_4O_8$ from 80 to 108 K under very high pressure, and the potential for molecular engineering of superconductors by using superlattices of superconducting and nonsuperconducting layers.

From the materials point of view, the main interest still lies in bulk and thin film $Y-Ba-Cu-O$ phases. $YBa_2Cu_4O_8$ and $Y_2BaCu_7O_{15}$ compounds are expected to be more widely investigated as low-pressure synthesis methods become available. Also, Bi-cuprates, particularly in bulk form, have received appreciable interest. Other papers dealt with n-type superconductors, La_2CuO_4 derivatives and Pb-doped materials.

The understanding that materials research is at its best in interaction with solid

state physics led to the European Physical Society's offer to co-sponsor this E-MRS symposium for the first time. Talks were given by distinguished European, American and, for the first time, Japanese solid state physicists. Their lectures covered spectroscopies, transport phenomena, magnetism, pinning, theory, and applications.

That we learn more when the starting materials are of high quality strongly encourages efforts to make better quality materials by thermodynamically controlling important parameters such as oxygen nonstoichiometry and phase purity. Since these compounds have four or more components, the extremely difficult task of determining thermodynamic control will require the best laboratories.

The 1,600 page, two-volume proceedings from this symposium have already been published by Elsevier North-Holland.

E. Kaldis

Metal Matrix Composites (Symposium B)

Chairs: G. Chadwick, *Hi-Tec Metals R&D Ltd., (United Kingdom)*, L. Froyen, *K.U. Leuven (Belgium)*, and T. Bunsell, *École Nationale Supérieure des Mines (France)*.

Andreas Mortensen of Massachusetts Institute of Technology opened this symposium with a plenary talk on interfacial phenomena in solidification-processed

MMCs, a subject fundamental to MMCs produced with a molten metal. The next two and a half days featured some 35 talks on a wide range of MMC-related topics, from the fundamentals of reinforcement matrix interface reactions through mechanical properties, the heat treatment, and the machining of this type of material to some speculative talks on where MMCs may be going in the future.

A.R.E. Singer of spray forming fame opened the first session with an invited lecture. He described the early work in Swansea, its development over some years, and its current status as one of the most flexible ways to produce particulate reinforced composites with a variety of matrices. Other MMC production routes described in this opening session included low-pressure infiltration, squeeze casting, and powder metallurgy techniques.

The second day focused on two broad topics. First, interfacial phenomena were described in papers on wetting and interfacial chemistry, the kinetics of silica/aluminum composites, microstructural characterization of aluminum/aluminum composites, alumina/molybdenum interfaces, and diffusion barrier coatings in SiC-Ti composites. Second, the largest session in the meeting, a session on mechanical properties, began with an invited paper by H. Lilholt (RISØ Denmark) on deformation in MMCs. One of the important points revealed during this session was the beneficial mechanical properties achieved in conventional magnesium casting alloys reinforced with short alumina fibers in squeeze casting. Both K.U. Kainer (Clausthal, Germany) and T.M. Yue (Hi-Tec Metals, United Kingdom) noted improvements in modulus, strength, and fatigue properties at both room temperature and elevated temperature for these composites over and above their monolithic counterparts. This was in contrast to most of the Al-based MMC materials where no significant improvement in room temperature properties was normally observed over those of the matrix materials.

On the final day, two short sessions covered post-production processing and applications. The last session revealed some interesting information on where MMCs are currently used and thoughts on where they will find further applications.

The symposium was preceded by a four-day summer school in the pleasant surroundings of the Vosges mountains. It covered many of the topics presented at the meeting, but dealt with them more thoroughly in a less formal atmosphere, benefiting all the attendees.

A. Boyce



Magnetic Thin Films Multilayers, and Superlattices (Symposium C)

Chairs: A. Fert, *University of Paris (France)*, G. Guntherodt, *RWTH Aachen (Germany)*, B. Heinrich, *Simon Fraser University (Canada)*, and E.E. Marinero, *IBM San José (United States)*.

Of the 162 papers presented during this four-day symposium about 90 were given as poster presentations, which were very well attended at the Palais Josephine in the park next to the Palais de L'Europe.

The oral sessions centered on the topics of growth and structure, interlayer coupling and magnetoresistance, magnetic domains and structural characterization, and magneto-optic, light scattering and magnetic processes, ultrathin structures, magnetic devices, diluted magnetic semiconductors and multilayered structures, anisotropic effects, and spectroscopic characterization.

Some 20 invited papers were presented by speakers representing 10 different countries, including Japan, United Kingdom, United States, Canada, Spain, and Poland. The symposium schedule was so packed that some sessions continued until 9 p.m. with some invited papers and the poster sessions until 10:30 p.m.!

The proceedings will be published in mid-1991 by North-Holland.

Ian W. Boyd

Metallurgical Coatings and Materials Surface Modifications (Symposium D)

Chairs: Hans E. Hinterman, *CSEM Neuchâtel (Switzerland)*, and Jean Spitz, *CEREM, Grenoble (France)*.

With specific support from Société Industrielle des Combustibles Nucléaires and Hydromécanique et Frottement.

This symposium brought together over 90 international researchers from universities, government laboratories and industry, with diverse backgrounds and interests in a wide range of coatings and surface modifications processes. Seventy-three papers, including 7 invited talks and 38 oral communications, were presented on a large number of topics.

The symposium started with a session devoted to tribological coatings, featuring an invited paper by M. Godet (INSA, Lyon) on the pluridisciplinary approach to coatings for tribological applications. Contributed papers on the latest studies on reducing wear and friction by using ion beam processing followed.

The next session covered recent studies

on surface modification using ion implantation in order to improve the mechanical and chemical behavior of bulk materials.

Two other sessions were devoted to coatings by physical and chemical vapor deposition processes, including three invited papers. One was presented by F. Löffler (RWTH, Aachen) on the arc evaporation of chromium nitride and chromium-aluminum nitride. The second was presented by N. Franck (University of Leuven) on the implantation of carbon in PVD titanium nitride. The third was presented by C. Sella (CNRS, Meudon) on biocompatible ceramic coatings obtained by sputtering. Contributed papers covered such topics as nitride and boride deposition by sputtering, ion-beam-assisted evaporation (including computer modeling of boron nitride deposition by W. Moller, Munich), and chemical vapor deposition.

The session on coatings characterization included an invited paper by J. Dojrzak (University of Dortmund) on the bonding mechanism of thermally sprayed coatings. Contributed papers covered the investigation of coating-substrate interfaces, non-destructive testing by photothermal radiometry, and shear stress measurements.

The session devoted to carbon and diamondlike coatings focused on the deposition and characterization of this type of material. An invited overview talk by A.M. Bonnot (CNRS, Grenoble) described the diverse characterization methods of diamond and diamondlike materials. Contributed papers addressed deposition by dual ion beam sputtering, ion-beam-assisted sputtering, plasma-assisted CVD, and coatings investigations by RAMAN and electron spectroscopy.

Two final sessions on the applications of surface modification processes by laser gradation enjoyed sustained interest and showed significant progress in the field. An invited paper by Fellows (University of Liverpool) and 10 contributed papers reported on results recently obtained by laser surface melting and rapid solidification of bulk and coated materials mild steel.

The symposium was well attended and it appears that surface science is still a rapidly growing field.

Hans E. Hinterman
Jean Spitz

Surface Processing and Laser Assisted Chemistry (Symposium E)

Chairs: I.W. Boyd, *University College London (United Kingdom)*, E. Fogarasy, *CRN, Strasbourg (France)*, and M. Stuke, *Max-Planck-Institut, Göttingen (Germany)*.

This symposium attracted 16 invited talks, 43 contributed talks, and 50 poster presentations from over 20 countries. The distribution of the 16 invited talks over the four days ensured a good balance between reviews and more topical issues. The topics ranged widely from fundamental investigations to industrial laser applications. Several papers dealt with various chemical vapor deposition techniques. In particular, D.C. Bradley (Queen Mary College, London) addressed the development of new chemical precursors for laser-assisted MOCVD to improve material quality and deposition rates. The understanding of fundamental mechanism in such processes was outlined by R. Larciprete (ENEA, Rome) in a talk entitled "Photo Processes in Organometallics." This presentation described a basic study of the gas-phase photochemistry of tetramethyl tin, $(CH_3)_4Sn$ under 193 nm radiation from an ArF excimer laser.

There also were reports on laser ablation/deposition of high T_c superconductors, new progresses in patterning and texturing of polymer surfaces by laser ablation, advances in scanning tunneling microscopy and time-resolved laser induced fluorescence spectroscopy. For surface processing, contributions from ABB, Bellcore, Dduco, IBM, NEC, Philips, Siemens, and Thomson CSF revealed several stimulating research topics from industry in Europe, Japan, and the United States. The talk "Industrial Laser Applications" by F. Bachman (Siemens AG, Munich) demonstrated the first example of using several excimer lasers in an assembly line to fabricate multilayered printed circuit boards. Other examples of "industrial talks" included "Multichip Packaging for Very High Speed Digital Systems" by A.F. Bernhardt (Lawrence Livermore National Laboratory, California), "A High Temperature STM Study of Adatom Migration During the Initial Stages of MBE" by E.J. Van Loenen (Philips Research Laboratory, Eindhoven, Netherlands) and "Scanning Tunneling Microscopy and Technical Applications" by H. Strecker (IBM, Mainz, Germany).

A clear blue sky during the four-day meeting (and free beer!) contributed to the success of the poster session held in the excellent open-air settings of "Pavilion Josephine." On the whole the symposium successfully brought contact and cooperation between industry and educational and basic research establishments.

P. Patel
Y. Zang
E. Petit

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