

Inaugural Rhine-Ruhr International Materials Conference Focuses on Energy

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The inaugural Rhine-Ruhr International Materials Conference was held at Villa Hügel in Essen, Germany, October 23–24, 2005, at which a materials science award—worth €100,000—was presented to Georges Martin, scientific advisor to the high commissioner of the French Atomic Energy Commission. Martin received the award for his groundbreaking “driven alloys” materials concept for the production of highly resistant materials. These materials can be used, for example, to enhance safety in transportation and industrial facilities, such as nuclear power stations. The award was presented to Martin by Nobel Laureate Zhores I. Alferov of the Ioffe Physico-Technical Institute.

Initiativkreis Ruhrgebiet, an association of 58 companies based in the area of the Rhine and Ruhr rivers in Germany, organized the materials conference, which also honored the lifetime achievements of Adolf Goetzberger, founder of the Fraunhofer Institute for Solar Energy Systems in Freiburg and honorary director of the International Solar Energy Society. Goetzberger received the Materials Science Life’s Work Medal.

“The aim of the Rhine-Ruhr International Materials Conference and Award is to build for the future and stimulate materials innovations of international significance,” said Ekkehard Schulz, executive board chair of ThyssenKrupp AG and moderator of Initiativkreis Ruhrgebiet. The conference, which focused on “Materials Research and Materials Techno-



The inaugural Rhine-Ruhr International Materials Conference, held October 23–24, 2005, featured a panel discussion on “The Novel Solutions: Material and Technology Aspects for Future Energy Supply.”

logy—Energy for the 21st Century,” brought together an international group of 130 experts from the worlds of science, industry, and policy to discuss global concepts for energy solutions, from fossil and renewable energies to nuclear fission and fusion to hydrogen technology and fuel cells.

A series of 10 questions were directed at conference participants relating to this broad range of technologies, as well as to energy efficiency (termed “gray energy”) and the distribution of global energy supplies. While materials technologies stand at the core of many routes to energy production, political solutions are needed

also. A roadmap integrating materials research into an energy solution is needed but does not yet exist.

During a press conference preceding the conference, Schulz said, “Research into nuclear fusion and the safety of nuclear energy is clearly a task for government. The scientific basis for nuclear technology must be retained to defend its position in the international debate on its future use. My opinion on this is confirmed by the latest study from the Federation of German Industries on a sustainable energy policy for Germany. Alternative technologies such as solar and wind energy, fuel cells, and coal gasification must still demonstrate their feasibility in both technical and economic terms.”

The power-generation and nuclear industries are developing new, ultraheat-resistant materials that significantly increase efficiency, reduce emissions, and improve safety. Also, “forgiving” properties are desirable, as are predictable properties, so that inspections can warn of aging. To extend the life of aging plants, better life prediction is required. For nuclear fission, stability against corrosion, high temperatures, and irradiation damage is needed, with a focus on safety, security, and waste management. Nuclear fusion was discussed, in particular the experimental projects such as JET (Joint European Torus) and ITER (an international project on fusion energy), with a concern about the lag of materials development, whose qualification can take 15–20 years. Ian Cook, manager of the fusion technology and materials program at the U.K. Atomic Energy Association’s

Alferov Presents Public Talk on Heterostructures

On the day after the completion of the inaugural Rhine-Ruhr International Materials Conference, Nobel laureate Zhores I. Alferov of the Ioffe Physico-Technical Institute gave a special presentation to the local public on “Heterostructures—New Type of Materials.” Sponsored by Initiativkreis Ruhrgebiet, the lecture was followed by an interview of Alferov by noted science journalist Ranga Yogeshwar. Previously, 23 Nobel Laureates have given presentations in this series.

Alferov described how changing atomic composition can create properties that never existed in nature, opening many possibilities. Heterostructures are semiconductors made of thin layers often only a few atoms thick. Herbert Kroemer in the United States and Alferov in Russia independently developed a double-heterostructure laser. Today there is a laser diode in every CD player, computer, and barcode reader, and data are transmitted by this means 1000 times faster than through electrical connections. Alferov concluded his talk by saying that science is the most interesting branch of human endeavor, and that the science community should again agree that work has no borders.

“We are one society of people,” he said.

In the interview, Yogeshwar asked what the key was to research success at Alferov’s institution. While there are many difficulties and even maybe criminal acts in Russia, Alferov replied, the policy of the government has remained the same, that science is the most important endeavor, because it is the basis of all else.

Culham Science Centre, said that the economics of fusion is a materials issue—such as, for instance, extending the lifetime of in-vessel components and increasing the operating temperature of components near the plasma.

While nuclear waste management was seen as largely a political issue, a move from fission to fusion was mentioned as a way to reduce waste. Wind energy is an important solution to increase capacity in the near term. In 2004, one-third of the world's 47.6 GW of wind power was generated in Germany, supplying about 6% of Germany's electricity, according to Christian Nath, managing director of Germanischer Lloyd WindEnergie GMBH in Hamburg. Offshore wind is another big market, with plans to add 20 GW of wind power from the North Sea and Baltic wind farms. However, construction and connection to the electrical grid remain challenging. Reducing the cost of turbine blades is one area of materials work that could make wind power more economically competitive.

Solar energy was seen as a complementary technology with wind in that both technologies are dependent on environmental conditions, and often when conditions for one are not ideal, the other is available. The key for solar technology is cost reduction and storage so that power is available when it is needed. While increased efficiency is important—for instance, achievements of 35% efficiency with multijunction photocells—the increased costs of such advanced technologies often offset their advantages, making it possible that inexpensive large-scale processing will outweigh raw efficiency increases. Solar energy has the added advantage that it is an enduring source and therefore likely to play a role in the long-term world energy supply.

Klaus Töpfer, executive director of the United Nations Environment Program, headquartered in Nairobi, Kenya, talked about energy concepts for closing the gap between demand and environmental protection, touting "environment for development." With 1.3 billion people



Georges Martin (left) of the Atomic Energy Commission in France received the inaugural Rhine-Ruhr International Materials Award 2005 of €100,000. Here, Martin confers with Elton Kaufmann (Argonne National Laboratory) during a reception following the awards ceremony.

without access to clean water and 2.4 billion without sanitation, energy is a primary need, and development cannot come without an economic driver for it. Töpfer said that energy has consequences for the stability of the planet, in addition to effects on the environment. The poorest of the poor are suffering the most, and thus a focus on making energy available economically is key, suggesting that reliable bureaucratic government can be good in this respect.

In the area of energy efficiency, Ming Yang, energy and environmental economist for the International Energy Agency (IEA) in Paris, gave a presentation on Chinese energy-efficiency policies leading to cleaner energy production in China. The Chinese government's energy strategy from 1980 to 2000 was to quadruple GDP (which in 2004 was \$1.65 trillion) while just doubling energy consumption, whereas an increase in GDP typically requires an equal increase in energy con-

sumption. This plan holds for 2000 to 2020 as well. Energy efficiency is the tool the Chinese are using, through technology upgrades in manufacturing, transportation, and household settings; efficiency mandates; and other mechanisms. When asked what the rest of the world can do to help China, Yang said that China needs technology transfer—materials and production know-how—at low cost. This led to a contentious discussion of what is a fair cost in a competitive world of developed and developing economies.

Moving toward a more integrated solution, Paul M. Siffert, general secretary of the European Materials Forum (EMF) and of the European Materials Research Society (E-MRS), described new pathways for cooperation between materials science and industry. EMF seeks to balance research, industry, and politics, with each sector being led, respectively, by Alferov, Schulz, and Michal Kleiber (Minister for Science in Poland).

Schulz said that the *Initiativkreis Ruhrgebiet* aims to strengthen cooperation between the various materials disciplines and reinforce the links between research, science, and industry. "Important aspects of this are international know-how transfer, support for young materials researchers, and the establishment of a virtual network of skills from materials science and industry. This combination of basic research, materials expertise, and market implementation is crucial, as it is the only way of ensuring that good ideas are turned into marketable products," he said.

In addition to the awards ceremony—featuring a trumpet fanfare and a video dedicated to George Martin—the conference included a performance by Russian pianist Boris Berezovsky, complete with six encores.

Initiativkreis Ruhrgebiet and main sponsor ThyssenKrupp were joined by EMF, E-MRS, the International Union of Materials Research Societies, and the Federation of European Materials Societies in sponsoring the conference. □

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BMMD 2005 Addressed Transition of Biomaterials and Medical Devices from Research to Business Activities

www.eng.tau.ac.il/conferences/BMMD2005.html

The conference on Biomaterials and Medical Devices 2005: Science, Technology and Business was held in Ramat-Gan, Israel, on November 17, 2005. It was followed on the next day by a series of one-on-one business meetings with Israeli companies.

This gathering was hosted and sponsored by the Israeli Materials and Processes Society and was also sponsored by Millennium Materials Technologies Funds, Technion—Israel Institute of Technology, and Tel-Aviv University. It was endorsed by Biomaterials Network, Controlled Release Society, European Society for Biomaterials, Israel Venture Association, the Israeli Chapter of the Controlled Release Society, and the Materials Research Society. The conference was co-chaired by Noah Lotan (Technion—Israel Institute of Technology), Noam Eliaz (Tel-Aviv University), and Oren Gafri (Millennium Materials Technologies Funds).

The 2005 conference was the third in a series. As with the previous meetings, it was driven by the understanding that biomaterials play a vital role in the development of new healthcare products, an activity that relies heavily on science in general and on scientific research in particular. Undoubtedly, the results of research in the areas of concern are impressive. However, if the achievements of this scientific undertaking are to reach the commercial market, they have to be translated into economically viable technological processes. To this aim, the involvement of financial tools as well as of a business approach, and concern for intellectual property, regulatory aspects, and a pertinent environment, are absolutely required. With this picture in mind, these conferences are meant to be not just typical scientific gatherings, but open forums where scientists, industrialists, and venture capitalists meet and exchange views.

The first conference in this series, held in 2003, was opened by Ephraim Katzir (Weizmann Institute of Science, Rehovot, Israel), one of the pioneers in the field of biopolymers and former President of Israel. He presented an exciting overview of the current achievements in this area while pointing out that the pertinent scientific foundations were laid some 40 years ago.

In the second conference, held in 2004, non-Israeli guest speaker Robert S. Langer

(Massachusetts Institute of Technology, USA) presented a sound and scholarly review of the highlights of two current main outlets for biomaterials: controlled drug delivery and tissue engineering. In doing so, he emphasized not only highly visible achievements, but also less visible failures and what the biomaterials community should learn from them.

The third gathering in this series, BMMD 2005, was organized in five sessions, each involving three or four lectures. The last session included a roundtable discussion. The non-Israeli guest speaker was Arthur Coury, vice president for Biomaterials Research at the Genzyme Corp. in Cambridge, Mass. Coury enjoys an outstanding appreciation for his seminal studies on hydrogels and, particularly, on the photocrosslinked and biodegradable ones. His presentation, "Tissue Engineering: Product Status, Challenges and Prospects," was an encompassing and instructive overview of a burgeoning activity taking place currently in academia as well as in startup and corporate settings. From his high position in one of the top biotechnological companies in the world, he concluded that, despite reduced investments in this field, the era of "regenerative therapy" seems destined to supplant the current era of "replacement therapy."

Michael Sela, a world-known leader in chemical immunology and former president of the Weizmann Institute of Science in Rehovot, Israel, addressed synthetic polypeptides as therapeutic vaccines against autoimmune diseases. Among the materials considered, he emphasized Copaxone, the first polymer that is the active ingredient of a drug. This is a synthetic, random copolymer of four amino acids—glutamic acid, lysine, alanine, and tyrosine—that is highly effective against the exacerbating-remitting type of multiple sclerosis; it has been used successfully by many tens of thousands of patients. An additional potential application of this copolymer is in preventing transplant rejection. Copaxone—produced and marketed by the Teva Co. in Israel—represents an annual market approaching \$1 billion.

Two additional lectures addressed scientific aspects of and therapeutic approaches to cancer. A. Levitski from the Hebrew University in Jerusalem, a laureate of the Israel Prize in Biochemistry and Wolf Prize in medicine, presented fundamental achievements in understanding cancer and

potential avenues for its treatment. A. Gabizon, from the Hebrew University in Jerusalem and Shaare Zedek Medical Center, described the development of Doxil, a representative of the new generation of drug-loaded liposomes for targeting cancer. Doxil contains a known chemotherapeutic drug, Doxorubicin (also known as Adriamycin). Upon incorporation in appropriate liposomes, its undesired side effects are significantly reduced.

Coming from a different perspective, R. Azhari (Vice President for Academic Affairs at the ORT Braude College of Engineering, Karmiel, Israel) described the experience of her institution and its success in training students for performing in the modern, fast-changing bio-industry. Thus, in addition to attending regular courses and laboratory courses, the students must also spend an apprenticeship period of about 10 months, preferably in an industrial environment. This is a most valuable feature, she said. It provides future graduates with the opportunity to familiarize themselves with the "real world" that they are about to enter. In addition, the host industrial companies have the opportunity to become acquainted with these graduates and assess their performances, a relationship that often results with a job offer.

Highly relevant to this series of conferences and with a similar point of view were the lectures delivered by a large group of participating venture capitalists: A. Harel (Israel Venture Association), R. Krupik (ARTE Venture Group), A. Molcho (Giza Venture Capital), and T. Regev (Pitango Venture Capital) as well as H. Ron (Israel Healthcare Venture). The common denominator of their presentations was that, in the areas of concern, venture capital tends to become involved mostly in the advanced stages of development of the biomedical enterprises rather than in the very early and high-risk ones.

Yet another point of view was set forth by O. Petrushka from the Prologue Technology Entrepreneurship. Petrushka and his colleagues, as founders of a communications equipment company that later sold to Lucent Technologies for almost \$5 billion, discussed the "valley of death": the period between academic success and a viable start-up company.

NOAH LOTAN, NOAM ELIAZ,
AND OREN GAFRI
Co-Chairs, BMMD 2005 Conference

Yu-MRS Celebrates 10th Anniversary during YUCOMAT 2005

www.yu-mrs.org.yu/conf05.htm

The Seventh Yugoslav Materials Research Society Conference (YUCOMAT 2005) was held September 12–16, 2005, in Herceg Novi, Serbia and Montenegro, in conjunction with the 10th anniversary of Yu-MRS. The Institute of Technical Sciences of the Serbian Academy of Sciences and Arts served as general sponsor of the conference.

The program for the 2005 conference consisted of four plenary sessions and five one-day symposia dedicated to advanced methods in materials synthesis and processing, advanced materials for high-technology application, nanostructured materials, composites, and biomaterials. The objective of the conference was to critically consider the most significant problems in materials science and engineering and to present to the domestic and international public, in the best possible way, the status and possibilities in this field. More than 200 attendees presented 221 papers, including 22 invited lectures, during the various plenary sessions, 45 oral presentations, and 154 poster presentations. The official language of the meeting was English. More than 30 countries on all continents were represented, with 55 papers coming from non-Yugoslav laboratories, 50 papers from joint international research teams with researchers in Yugoslavia, and the rest from Yugoslavian researchers. Proceedings of the conference, as for the previous six conferences, will be published by Trans Tech Publication Ltd, Zürich, Switzerland (www.ttp.net), as selected papers in *Materials Science Forum Edition*, Vol. 518, May 2006.

At the Opening Ceremony, Dragan Uskokovic, president of Yu-MRS and director of the Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, gave a welcome speech about the 10-year-long journey of the YUCOMAT Conference and Yu-MRS (1995–2005). Yu-MRS was formed as a professional association whose main goals and tasks are to encourage creativity in materials science and engineering, achieve harmonic coordination of these fields in Yugoslavia, and connect the organization with analogous activities worldwide in order to integrate the Yugoslav materials research community more easily into international research programs. Over the years since the first YUCOMAT conference, the meeting has transformed itself from a purely national to an international event.

Uskokovic said, "Yu-MRS is a very young society compared to other MRS societies and more than hundred-years-old



Attendees of YUCOMAT 2005.

prestigious scientific societies hereabout and abroad. Nevertheless, our success during the first 10 years raises hopes that Yu-MRS has a future which opens new horizons of research fruitfulness, with



Yu-MRS President Dragan Uskokovic gave the welcome speech celebrating 10 years of the Yugoslavia Materials Research Society.



Branko Matovic and Fritz Aldinger discuss the poster presentation.

potentials to enrich both the domestic and international scientific community and the ordinary man."

During the first plenary session, F.M. Ross (IBM), R. Sinclair (Stanford University), I. Bozovic (Brookhaven National Laboratory), and A.P. Philipse (Utrecht University, the Netherlands) addressed fundamental problems in advanced materials and nanotechnologies.

During the second plenary session, V. Radmilovic (University of California, Berkeley and Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro), P.D. Maguire (Ulster University, Jordanstown, Northern Ireland), Z. Konstantinovic (University of Barcelona, Spain), and J. Degmova (Slovak University of Technology, Bratislava, Slovakia) presented lectures on highly sophisticated methods to characterize metal nanomaterials and their magnetic properties.

The third plenary session consisted of seven invited lectures, with the first part dedicated to various spectroscopic methods of characterization and the second to nanostructural materials and fullerenes. C.J. Seliskar (University of Cincinnati), H. Stoeri (University of Technology, Wien, Austria), and J.C. Badot (National Research Center, Paris, France) spoke in the first part. F. Aldinger (Max-Planck Institute for Materials Research, Stuttgart, Germany), S. Pejovnik (Faculty of Chemistry and Chemical Technology, Ljubljana, Slovenia), R.A. Andrievski (Institute for Chemical Physics Problems, Chernogolovka, Russia), and E.F. Sheka (Russian University for New Materials, Moscow, Russia), spoke in the second part.

The fourth plenary session also consisted of seven invited lectures. The first part was dedicated to organic materials and nanocomposites (N.S. Sariciftci, Johan Kepler University, Linz, Austria; M. Ilavsky, Institute for Macromolecular Chemistry of the Czech Academy of Science, Prague, Czech Republic; and Z.S. Petrovic, Pittsburg State University, Kansas). The second part of the session addressed various problems of application of advanced materials and their characterization for different nanotechnology disciplines and other high-tech fields

(F.T. Hong, Wayne State University, Detroit; S.I. Macura, Mayo Clinic and Mayo Foundation, Rochester; Ph. Goldner, National Research Center, Paris, France; and A. Auroux, Institute for Catalysis of the National Research Center, Villeurbanne, France).

To recognize prospective young scientists, 35 and younger, Yu-MRS honored Nina Obradovic (Institute of Technical Sciences of SASA, Belgrade) for the best masters thesis; Nenad Marjanovic (Linz Institute for Organic Solar Cells, Johannes Kepler University, Linz, Austria) and

Jelena Radovanovic (Institute for Physics, Belgrade) for best oral presentation; and Tamara Ivetic (Institute of Technical Sciences of SASA, Belgrade), Dejan Milicevic (Vinca Institute for Nuclear Sciences, Belgrade), and Igor Balac (Faculty of Mechanical Engineering, Belgrade) for the best poster presentations.

DRAGAN USKOKOVIC
President of Yu-MRS and
Director of the Institute of
Technical Sciences
of the Serbian Academy of
Sciences and Arts