RARE-EARTH INFORMATION CENTER NEWS

ENERGY AND MINERAL RESOURCES RESEARCH INSTITUTE
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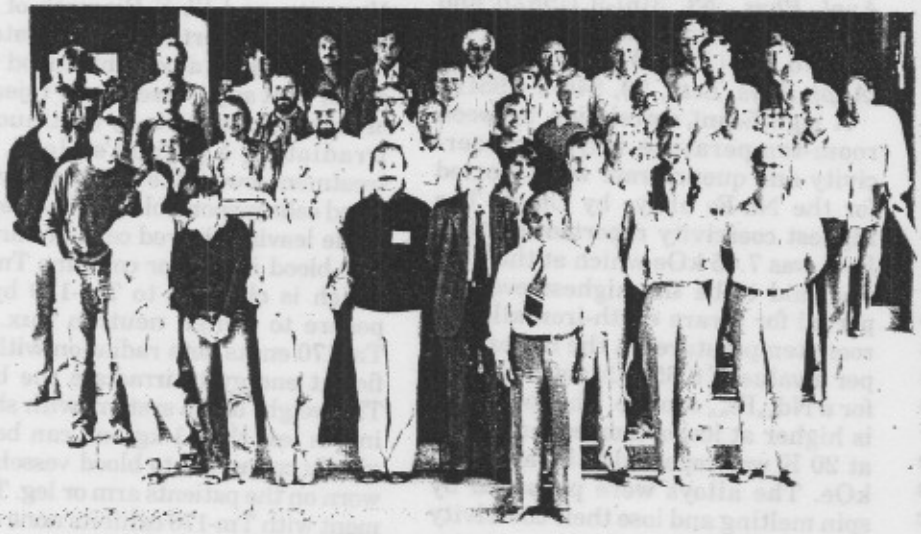
1982 NATO Summer School—



Left to Right, First row: C. Khan-Malek, P. Vandevelde, N. Sabbatini, G. DePaoli, W. Klemm, S.P. Sinha, M.C. GüLovali, L. Zinner, G. Vicentini **Second row:** S. Hüfner, L. Klemm, K. Rajnak, G. Netz, D.R. Chopra, T. Serin, L. Couture, G. Morteani, P. Cerney, P. Möller **Third row:** P.C.M. Gubbens, G.K. Muecke, W. Urland, H.D. Amberger, L. Brewer, T. Saltoglu, N. Serin, J.C. Barnes, B. Kanellakopulos, J.C. Duchesne, L. Thompson, J. Ascenso **Fourth row:** A. Engelen, J. Hölsä, D. Read, R.K. Larsen, W. Grosshans, G.J. Palenik, N. Neyt, W.T. Carnall, L. Suchow, L. Niinistö, A.O. Brunfelt **(Missing from the picture:** S.M. Taher, J. Rossat-Mignod, L.E. Delong, H.L. Skriver)

Systematics and Properties of the Lanthanides

The International Summer School on the Systematics and the Properties of the Lanthanides, sponsored by the NATO Advanced Study Institutes, was held in Braunlage, West Germany from July 11-25, 1982. Forty-six scientists from 14 countries attended the school. The school was directed by Shyama P. Sinha, who is also the editor of the Proceedings to be published by D. Reidel Publishing Company, Dordrecht, The Netherlands. Availability of the Proceedings will be announced by *RIC News*.

The highlight of the Conference was the opening lecture by the guest of honor, 86 year old Professor W. Klemm, who during the early thirties developed the first systematics of the lanthanides. The personal reminiscences of Klemm were deeply appreciated by the participants in view of the fact that the experiments were carried out during a time when modern electronic instrumentation was not available. Prof. Klemm and his co-workers realized quite early the importance of the electronic configurations involving f^n, $f^{n'}$, $f^{n''}$ in the chemistry of the lanthanides.

Other plenary lectures were as follows. L. Brewer talked about the influence of the electronic configurations on the stability and thermodynamic properties of various crystal structures of the lanthanides and actinides, and their melting and boiling points. S. P. Sinha showed

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EDITOR'S TRIP REPORT JAPAN 1982

Last fall I was fortunate enough to visit Japan not only for the first time but twice in a three month period. In September I presented an invited paper on spin fluctuations at the International Conference on Magnetism (ICM-82) and in November I addressed the members of the newly formed Rare Earth Society of Japan.

Japan is dynamic, vibrant, beautiful, punctual and friendly. It was a wonderful opportunity for me to visit nine institutions and discuss rare earths and other science and technology with many Japanese scientists, engineers and technical managers. And when possible I visited many of the temples, shrines, castles and national parks. But best of all it was a delightful pleasure visiting with many friends and colleagues whom I had known over the years, and making new friends.

ICM-82

The International Conference on Magnetism, which was held in Kyoto, is held every three years and about 1200 persons attended this year (~65% from Japan). There were two plenary sessions (two invited speakers each), eight symposia sessions (three invited speakers each), 38 oral sessions (21 invited speakers presented papers in these sessions) and 45 poster sessions. As you can well imagine the 900+ papers covered a wide range of topics bearing at least some relationship to magnetism. The proceedings of ICM-82 will be published in the *Journal of Magnetism and Magnetic Materials*.

An exhibit of industrial products included rare earth cobalt permanent magnets, garnet type materi-

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Summer School
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how the fundamental properties of the metallic radii, ionization potentials, structural parameters, and the stability of complexes in solution could be systematized in terms of the ground state L values of the ions. G. S. Palenik and L. Niinistö pointed out that the lanthanides tend to form highly coordinated complexes with coordination geometries dictated mainly by the organic and inorganic ligands. H. L. Skriver gave a theoretical treatment of the electronic structure of the lanthanide metals and the variation of the physical properties through the series. S. Hüfner talked about the optical spectra of the trivalent and divalent lanthanides in crystalline matrices, the free ion energy levels, and their perturbations by the crystal field. W. T. Carnall followed with a systematic examination of the spectroscopic parameters and the energy level calculations of the trivalent lanthanides in single crystal matrices and in aqueous solution. S. P. Sinha then discussed the fluorescence spectra and lifetimes of the lanthanide aqueous ions and their complexes. The use of paramagnetic lanthanide ions as NMR structural probes for organic and bio-molecules and the importance of the various parameters was presented by J. Ascenco. J. C. Duchesne and P. Möller reviewed the use of lanthanides as geochemical tracers or probes for igneous and nonmagmatic processes, respectively. J. Rossat-Mignod closed out the plenary lectures with a review of the magnetic properties of the lanthanide compounds in the solid state.

BUSINESS NEWS

Spooner Promotion

Rhone-Poulenc Inc., Monmouth Junction, New Jersey, announced that James P. Spooner has been named Director of Commercial Development for rare earths and aluminas. He will be responsible for directing Rhone-Poulenc's efforts to develop new uses and new markets for rare earths. Spooner, who has an MBA in marketing and a B.S. in chemistry, joined Rhone-Poulenc in 1980 and was marketing manager for special products.

New Magnetic Materials?

Two new alloy systems with intrinsic room temperature coercive forces nearly as high as that of many of the rare earth-cobalt alloys have been reported. Furthermore, neither system contains cobalt, which is expensive and in short supply. These investigations have raised the hope that economical, high performance magnets can be produced from an amorphous iron base alloy. J. J. Croat has reported on the magnetic properties of $Nd_{1-x}Fe_x$ *[Appl. Phys. Lett.*, **39**, 357-8 (1981) and *J. Appl. Phys.*, **53**, 3161-9 (1982)] and N. C. Koon and B. N. Das have reported on $(Fe_{0.82}B_{0.18})_{0.9}Tb_{0.05}La_{0.05}$ [*Appl. Phys. Lett.*, **39**, 840-2 (1981)].

A significant correlation between room-temperature intrinsic coercivity and quench rate was reported for the Nd-Fe alloys by Croat. The highest coercivity reported for $Nd_{0.4}Fe_{0.6}$ was 7.45 kOe which at the time was said to be the highest ever reported for a rare earth-iron alloy at room temperature. In the newest paper a value of 8.65 kOe was reported for a $Nd_{0.5}Fe_{0.5}$ sample. The coercivity is higher at lower temperatures and at 20 K was reported to be about 60 kOe. The alloys were prepared by spin melting and lose their coercivity if annealed at temperatures greater than 700 K (~400°C). The detailed nature of the coercivity mechanism could not be established. It is thought that the highest coercivity occurs in alloys whose quench rate and composition result in a microstructure analogous to the single-domain particle size aimed for when preparing permanent magnets by powder metallurgy methods.

Koon and Das report that lanthanum is the key to the high coercivity iron-boron alloys. Lanthanum, which forms no stable compounds with iron, seems to inhibit the formation of rare earth intermetallic compounds during the quench process. This makes possible the production of a wide class of amorphous iron-boron alloys containing up to 15 at.% rare earths. One such alloy, $(Fe_{0.82}B_{0.18})_{0.9}Tb_{0.05}La_{0.05}$ was reported to be magnetically soft in the amorphous state, however, when annealed at about 930 K it crystallizes and becomes magnetically hard. It is reported to develop a large hysteresis, with a room temperature intrinsic coercive force of about 9 kOe.

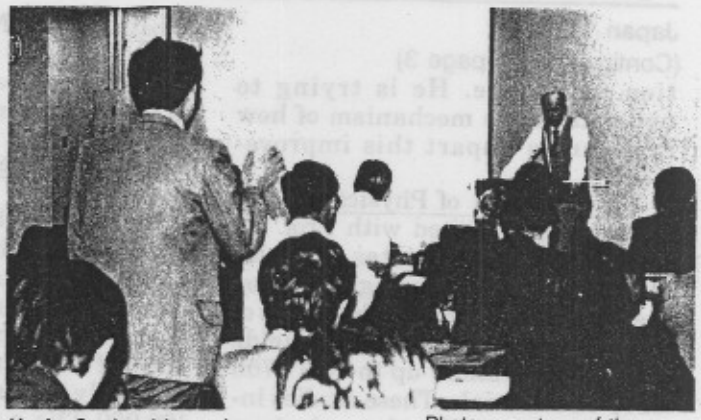
1982 IR 100

Two of the top 100 significant new technological developments of 1982 as determined by *Industrial Research and Development* contain rare earth materials [**24**, No. 10, 87-152 (1982)]. Six others may either contain rare earths or might be used to analyze for rare earths. The two that definitely have a rare earth connection are described below.

In the biomedical tools and materials division, L. R. Bunnell, F. P. Hungate, and W. F. Riemath of Battelle Pacific Northwest Laboratories have developed a portable blood irradiator that suppresses early rejection of organ transplants by continuously irradiating a patient's blood. The treatment lowers the number of white-blood cells responsible for the rejection while leaving the red cells unharmed. The blood irradiator contains Tm-169 which is changed to Tm-170 by exposure to a high neutron flux. The Tm-170 emits beta radiation with sufficient energy to irradiate the blood. The weight of the system, with shielding, is less than 1 kg and can be surgically connected to blood vessels and worn on the patients arm or leg. Treatment with Tm-170 exhibits none of the detrimental side effects associated with the conventional chemotherapy treatment.

In the processes and systems division, L. A. Boatner and M. M. Abraham of the Oak Ridge National Laboratory have developed a high level radioactive waste stabilization process. The process uses a synthetic analog of monazite to convert mixed lanthanide nuclear waste oxides into a highly stable orthophosphate waste form that can be disposed of safely. The monazite process has several advantages over other processes that have been considered for waste storage. It allows storage of twice the amount of waste per unit volume, has a 60 day leach rate that is only about $\frac{1}{300}$ as great, and is processed at a lower temperature. The monazite-type waste has been shown to be effective at containing Sr, Cs and the actinides under aqueous leaching conditions. Monazite has a proven long-term physical and chemical stability and a negative temperature coefficient of solubility making it an effective storage medium for a wide range of high-level radioactive wastes.

R. Ohmachi



K. A. Gschneidner, Jr.

Photos courtesy of the Rare Earth Society of Japan

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als—gadolinium-gallium (GGG) and yttrium-iron (YIG), and rare earth containing devices, e.g., bubble memory cards and bubble cassette systems.

THE RARE EARTH SOCIETY OF JAPAN

The inaugural meeting, which was held in Osaka, was only a half day long plus an evening banquet and was attended by about 65 persons. This initial meeting consisted of formally adopting the Society's constitution, electing officers of the Society and listening to two invited presentations. One talk was given by Mr. R. Ohmachi, Director and General Manager of Santoku Metal Industry Co., Ltd. and I presented the second. Mr. Ohmachi talked about the history of the rare earth industry and the current status of the industrial technical developments, primarily in Japan, while I presented an overview of "The Wonderful World of Rare Earths—Its Science, Technology and Industry." Copies of either talk are available upon request from RIC (the former in Japanese and the latter in English).

More information about The Rare Earth Society of Japan can be obtained by writing to Prof. J. Shiokawa (President) or Dr. G.-Y. Adachi (Secretary) both at the Department of Applied Chemistry, Osaka University, Yamada-Kami, Suita Osaka, Japan.

J. Shiokawa

Photo Courtesy of the Rare Earth Society of Japan

UNIVERSITIES AND RESEARCH LABORATORIES

University of Hiroshima

At the University of Hiroshima I visited with Prof. T. Okamoto, Dr. H. Fujii and their co-workers. They are carrying out interesting research on the magnetic properties (magnetic susceptibility, magnetization, neutron scattering and magnetocrystalline anisotropy), on both polycrystalline and single crystal intra-rare earth alloys. In these materials complex behaviors are found because each lanthanide element has its usual magnetic moment and *4f* electron directional characteristics which now compete with one another when the two lanthanide elements are alloyed. Other work involved similar studies on (R,R') Co_5, R(Ag,In) and RCu_2 intermetallic phases, and the influence of hydrogen on the magnetic properties of RM_2 compounds, where M = Mn, Fe and Co.

While in Hiroshima I was guided by Dr. T. Ito, who worked with me and Dr. S. Legvold at Ames, is now at the University of Shimane, and was a former student of Prof. Okamoto. Our discussions centered on our work on the heat capacity of LaD_3 and LaH_3 from 1 to 300K.

Osaka University

Several days were spent at Osaka University visiting three departments located on two campuses.

1. Department of Applied Chemistry: This Department is headed by Prof. J. Shiokawa, and Assoc. Prof. G.-Y. Adachi. Their main research projects involve electrical resistance measurements on thin films of amorphous $LaNi_5$ and its hydride, luminescence of divalent europium in various compounds, and chemical sensors for O_2 and for SO_2.

The amorphous $LaNi_5$ materials were prepared by flash evaporation on to a quartz substrate, and were hydrided to form $LaNi_5H_2$. They found that after 150 absorption-desorption cycles, the thin films remained intact and exhibited no degradation of properties if the film thickness was less than 10,000 A. This is remarkable since bulk $LaNi_5$ pulverizes upon hydrogenation, but this difference is probably due to the fact that amorphous films only absorb ⅓ the amount of hydrogen compared with the crystalline material.

The luminecence of Eu^{2+} measurements have been made on various polyethylene glycols, EuB_2O_4, crown ethers, and the compounds $MSiO_3$ and MB_2O_4 doped with Eu (where M = Ca or Sr). The most interesting thing is that the luminescence of the europium crown ether under ultraviolet radiation is 600 times that of an $EuCl_2$-methanol solution for the same Eu^{2+} concentration.

The chemical sensor work involves the use of CeO_2 base materials as O_2 sensors and the use of Na_2SO_4 doped with $R_2(SO_4)_3$ as a SO_2 sensor. It is notable that the latter material can be operated as low as 400°C, while the undoped material requires operating temperatures of 700 to 800°C.

2. Department of Materials Science and Engineering: Most of my discussions were held with Assoc. Prof. H. Nagai, who had worked with me in Ames. He has three research projects, two dealing with superalloys and one on the hydrogenation of TiFe alloys. One of the superalloy projects deals with a study of influence of rare earth additions on improving the corrosion and/or oxida-

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tion resistance. He is trying to understand the mechanism of how rare earths impart this improvement.

3. Department of Physics: In this Department I visited with Prof. M. Date and his associates Drs. M. Motokawa and A. Yamagishi. They are involved in studying the effects of high magnetic fields (pulsed fields [500 msec duration] up to 70 T [700 kOe]) on materials. These studies include the magnetization, electron spin resonance and Raman spectra of various materials including one dimensional ferromagnets. In addition they are designing, developing and building high field pulsed magnets up to 100 T. So far they have managed to reach 70 T in a double coil magnet, and hope to reach 100 T using a triple coil system. The main problem is the deformation of the metal coil by the high magnetic field when fields >50 T are attained. They believe this new design (double and triple coil arrangements) will allow them to reach 100 T without substantial damage to the inner coil. In this Laboratory the samples are unharmed and can be reused or studied by other techniques after the high field measurements. This technique differs from those used by the Institute for Solid State Physics, University of Tokyo (see below) in which much higher fields are reached but the sample is destroyed during the measurements.

Government Industrial Research Institute, Osaka

A half day was spent visiting the group headed by Dr. M. Nakane of the Government Industrial Research Institute at Osaka. Dr. Nakane's group is primarily concerned with developmental and pilot plant scale up of hydrogen generation, storage and combustion systems.

The hydrogen storage work involves the use of $MMNi_5$-based materials (where MM = mischmetal). They are studying the effects of alloying on the hydrogenation characteristics (the pressure required to hydride the alloy and the composition of the hydride phase) and the influence of cycling (up to 500 cycles) on the same parameters (generally no change has been noted). The alloying additions include the substitution of Ca for MM, and partial substitution of Ni by Al, Mn, Fe, etc. They have also built two stationary hydrogen reservoirs that can hold up to 16 m^3 of hydrogen.

Matsushita Electric Industrial Co., Ltd., Osaka

The second half of the day was spent visiting the TV assembly plant and the television tube assembly plant of the Matsushita Electric Industrial Co.—the world's largest producer of TVs. The Osaka plant, which is highly automated and produces 100,000 TVs a month, is one of the show cases of modern Japan. I was particularly interested in the manufacture of the TV tubes because the red color is produced by Y_2O_2S:Eu. This plant also manufactures the three band spectrum fluorescent lamps, which utilize three rare earth phosphors: Eu(III) for red, Tb for green, and Eu(II) for blue as the activators, and several different rare earth materials are used as hosts.

Kyoto University

In addition to attending ICM-82 in Kyoto, I returned in November to visit the Laboratory of Physical Chemistry, Kyoto University, headed by Prof. N. Hirota. The major discussions were held with Assoc. Prof. M. Mekata, who had worked with Dr. F. H. Spedding of the Ames Laboratory in the early 1960's. Dr. Mekata is studying γ-γ perturbed angular correlations of a variety of materials to explore the local atomic environment around a particular atom to study dilute Ce Kondo systems, the nature of hyperfine fields in La-Gd and $(La,Pr)Al_2$ alloys, and the paramagnetic regions of Er in Ho.

Research Center Mitsubishi Chemical Industries, Ltd., Yokohama

A good portion of my visit to the Research Center of Mitsubishi Chemical Industries, Ltd. was spent with Mr. T. Tomita discussing the preparation of rare earth metals. The laboratory is well equipped and most of their research is applied and is concerned with the development of new products. About 700 persons are employed at the Yokohoma site.

Meiji University, Kawasaki

At Meiji University I visited Prof. Y. Suzuki, Department of Industrial Chemistry and several of his colleagues and students. Prof. Suzuki, who spent two years in Ames working with Dr. F. H. Spedding in the early 1960's, is working on determining the stability constants of various scandium complexes. He is also working on selective ion electrodes using various rare earth compounds. To date, a CeO_2-containing electrode has been the most successful one, and it can be used for determining any of the rare earth ions or the total content of several of them in solution.

Institute for Solid State Physics, University of Tokyo

My last stop in Japan was a visit to the Institute for Solid State Physics, University of Tokyo. Their emphasis is studying materials at the extremes—ultra low temperatures, ultra high magnetic fields and high pressures. In addition they have some top-notch theorists who work mainly on magnetic phenomena.

My discussions with Profs. K. Yosida and T. Moriya dealt with the magnetic behavior of solids, especially spin fluctuations in highly enhanced and itinerant ferromagnetic materials.

Prof. S. Chikazumi's high magnetic field laboratory is one of the best in the world. Currently they are able to generate high pulsed fields up to 280 T, but because of the magnetic forces generated, the primary coil and sample are destroyed in the process. They are able, however, to complete the magnetization and optical property measurements on the solid before the materials are destroyed. They are building an apparatus in which they should be able to reach 500 T and are hoping ultimately to reach 1000 T. This new high field facility will be located in a new building. In addition they have two 3 T electromagnets and two 10 T and one 15 T superconducting magnets.

I also spent a few hours with Dr. H. Ishimoto discussing the ultra low temperature facility. They have a two stage nuclear hyperfine adiabatic demagnetization refrigerator, which uses $PrNi_5$ (as the first stage). They were testing their refrigerator when I was there, and had reached ~65 μK, but it was still cooling.

Research Institute for Iron, Steel, and Other Metals

I visited the Research Institute for Iron, Steel, and Other Metals (RIISOM) of Tohoku University, Sendai, Japan in mid-September. RIISOM is one of the oldest and outstanding research organizations in the

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CONTRIBUTORS

The third quarter of fiscal year 1983 was one of the best ever. Ten companies renewed their support and two new members joined our family of sponsors. This brings to 30 the number of companies that have given the Center support for this fiscal year. We will still need a very strong fourth quarter to equal last year's 45 benefactors but it is within our reach. The 12 companies who contributed to our financial health this quarter are listed below with the number of years the company has supported the Center given in parenthesis.

Aldrich Chemical Co., Inc., U.S.A. (4)
Atomergic Chemetals Corp., U.S.A. (11)
A/T Products Corporation, U.S.A. (3)
Colt Industries-Crucible, Inc., U.S.A. (9)
A. E. Dearth, Geological Consultant, U.S.A. (1)
Th. Goldschmidt AG, Germany (14)
GTE Laboratories, Inc., U.S.A. (11)
Hytec Enterprises Company, Hong Kong (1)
METSERV, Inc., U.S.A.(2)
Mitsubishi Chemical Industries, Ltd., Japan (9)
Research Chemicals, U.S.A. (15)
Yao Lung Chemical Plant, People's Republic of China (3)

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Durham 1982 Proceedings

The Proceedings of the fourth European Conference on the Physics of the Rare Earths and Actinides held in Durham, England, March 28-31, 1982 are available as Volume 29 of *Journal of Magnetism and Magnetic Materials*. Edited by B. K. Tanner and S. R. Hoon, the journal is published by North-Holland Publishing Company, Amsterdam. The price for this special issue is 260 Dutch Guilder or ~$104.00 U.S.

The Proceedings contains 9 invited reviews, 36 contributed papers, and 5 abstracts of talks presented at the Conference. The journal contains the following sections: 1. materials preparation and characterization; 2. rare earth elements and alloys; 3. rare earth intermetalics and compounds; 4. valence fluctuations; 5. transport properties; 6. electronic structures of actinides and their compounds; and 7. structure and properties of actinides and their compounds. Eleven of the papers deal exclusively with actinides.

Russian Acquisitions

The RIC has recently acquired the Russian book *Redkozemel'nye Poluprovodniki* [Rare Earth Semiconductors], edited by V. P. Zhuze and P. G. Rustamov. The 184-page book was published in 1981 by Izdatel'stvo ZLM in Baku, Russia. The book deals with binary and ternary rare earth chalcogenide compounds.

The RIC has also received numbers 15, 16 and 17 of *Redkozemel'nye Poluprovodniki. Bibliograficheskii Ukazatel Otechestvennoi i Inostrannoi Literatury* [Rare Earth Semiconductors. Bibliography of Russian and Foreign Literature], V. P. Zhuze, Ed., Fiziko-Teknicheskii Institut im A. F. Ioffe, Akademii Nauk SSSR, Leningrad. Bibliography 15 was published in 1981 while 16 and 17 were published in 1982. The fifteenth bibliography has 499 citations, the sixteenth has 623, and the seventeenth has 502. References are printed in their original language with an English or Russian notation as to subject matter. All the bibliographies have an English table of contents and author index.

International Conferences

New RE Conference

The First International Conference on the Chemistry and Technology of the Lanthanides and Actinides will be held in Venice, Italy on September 5-10, 1983. The Conference is the first in a planned periodical series, the sites of which will be chosen by the Scientific Committee.

The Scientific Program of the Conference will consist of 5 plenary lectures as well as 15 session lectures, contributed papers, poster sessions, informal workshops, and round table discussions. The Conference is organized into the following sections: (A) coordination and organometallic chemistry (including bio-inorganic chemistry and thermodynamic aspects); (B) theory and spectroscopy; (C) reactivity and catalysis; (D) solid state chemistry; and (E) technology (including analytical and environmental chemistry, health physics, and nuclear medicine).

The deadline for abstracts is June 15, 1983. The official language of the Conference is English and all abstracts should be submitted in English in the proper format to:

P. A. Vigato
Secretary First ICLA
Instituto di Chimica e Tecnologia Radioelementi
Area della Ricerca—CNR
Corso Stati Uniti 4
15100 Padova, Italy

Registration is $120 U.S. for active participants and $60 U.S. for wives and husbands of the active participants. The registration form and abstract format may be obtained from the above address or from the Rare-Earth Information Center.

Magnetism

An International Conference on Magnetism of Rare Earths and Actinides will be held September 1-4, 1983 in Bucaharest, Romania. The main topics of the Conference will be: theory and applications of metals, al loys, compounds, insulators and amorphous materials. For more information contact Dr. E. Burzo, President of the Organizing Committee, Central Institute of Physics, P.O. Box 5222, Bucharest, Romania.

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field of metal physics in the world and consists of 28 research laboratories each generally being headed by a full professor.

My host was Prof. K. Suzuki, who is the head of the Chemical Physics of Metals Laboratory. His main research interests are on the experimental elucidation of liquid and amorphous materials using neutron scattering, Compton scattering and EXAFS. Some of his work also deals with hydrogenation of amorphous and glassy materials.

I also visited the Laboratory of Prof. Y. Muto (Low Temperature Physics) who is concerned with superconductivity of a variety of materials and the coexistence of magnetism and superconductivity. Dr. Muto also heads the High Field Laboratory for Superconducting Materials, which is under construction. This Laboratory will test superconducting materials to carry out developmental work on superconducting magnets for fusion reactors. They plan to have a 25T 60 mm bore magnet in this Laboratory.

Iwate University

Iwate University is located in Morioka, the northern most city connected to the magnificent world renowned "Shinkansen" (bullet train). While there I visited with Dr. K. Ikeda, who worked with me in Ames in 1979-1980. Most of our discussions centered on spin fluctuation materials.

EPILOGUE

Both trips were professionally and personally rewarding, giving me a much better understanding and appreciation of Japan and its people—especially the scientists and engineers.

New Alloys for 1983

Alcoa is offering for evaluation a powder-metallurgy aluminum alloy with an Al-8Fe-4Ce composition. It was developed for use at elevated temperatures. Such a high rare earth concentration in an alloy is unusual.

Cabot's High Technology Materials Division is introducing a nickel base, solid solution strengthened superalloy—Haynes Developmental Alloy No. 230. The alloy, according to the developers, will offer excellent high temperature strength and superior oxidation resistance with essentially no cobalt. The wrougth material, which contain 0.03% La, was developed for applications in the hot section of gas turbine engines. Benefits include better in-service fatigue resistance and better weld repairability.

DEVIATING OXIDES

"Nonstoichimetric Oxides" are the subject and title of a book edited by O. T. Sørenson and published by Academic Press, New York. The book contains 441 + xii pages, costs $59.00 U.S. and was published in December 1981. The eight chapters, written by experts well known in their fields, are entitled: 1. Thermodynamics and Defect Structure of Nonstoichiometric Oxides; 2. Defect Clustering in Nonstoichiometric Oxides; 3. A New Method of Statistical Thermodynamics and Its Application to Oxides of the Lanthanide and Actinide Series; 4. Diffusion in Nonstoichiometric Oxides; 5. Mass Transport in Anion-Deficient Fluorite Oxides; 6. Mixed Conduction in Nonstoichiometric Oxides; 7. Structure, Defects and Nonstoichiometry in Oxides: An Electron Microscopic View; and 8. Structural Studies on Nonstoichiometric Oxides Using X-Ray and Neutron Diffraction.

The properties of many inorganic compounds are dependent on their degree of nonstoichiometry. This dependence plays an important role in present day solid-state research, especially in the oxide systems. Although only one chapter heading has reference to lanthanide oxides, each of the other chapters has material on the rare earth oxides or on other oxides doped with rare earth oxides. This book was published to present a detailed and up-to-date account of the present state of the art within this field.

ACS AWARDS

Chemical Instrumentation

Velmer Fassel, Deputy Director of the Ames Laboratory, has been selected to receive the 1983 Chemical Instrumentation Award. The presentation will be made at the American Chemical Society's meeting in Seattle later this month. The Dow Chemical Company sponsors the award, which is administered by the ACS Division of Analytical Chemistry. The award will be presented to Fassel at a symposium traditionally arranged as part of the tribute.

Harrison Howe Award

Pierre-Gilles deGennes, Director of the School of Physics and Chemistry at the College de France in Paris, received the 38th Annual Harrison Howe Award January 7, 1983 from the ACS Rochester Section. The award honored deGennes for his contributions to the theory of the behavior of polymers and liquid crystals. The name will be familiar to many rare earthers because of his work in the late 1950's concerning the variation of the paramagnetic Curie temperature as a function of the number of unpaired *4f* electrons of the individual lanthanide elements. This function is known as the deGennes factor and has been shown by others to account for the depression of superconductivity when a lanthanide is substituted into a host material.