Rare-earth Information Center NEWS

Ames Laboratory
Institute for Physical Research and Technology
Iowa State University / Ames, Iowa 50011-3020 / U.S.A.

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EASTER VACATION (?) IN ENGLAND

Chemicals for Electronics Industry

During the first few days after Easter, the editor visited central England to attend the Second International Symposium on Fine Chemicals for the Electronics Industry, which was held on the beautiful campus of the University of York, April 18-20, 1990. The meeting was sponsored by the Fine Chemicals and Medicinal Group and the Applied Solid State Chemistry Group of the Royal Society of Chemistry. The main purposes of the meeting was to bring together experts to present overviews, to lead discussions on the role of chemistry, to point out the major problems and suggest possible solutions, and to project the future directions in the electronic and electro-optical areas. There were 17 invited presentations, 4 by university professors and the rest by industrial scientists. Most of the speakers were from England (11), but 2 each came from Germany and the United States and 1 each from France and Japan. In addition there were 18 poster presentations. About 85 persons attended the conference.

The first afternoon was devoted to semiconductors, including Si and the III-V compounds (three papers). The next day, three papers dealt with liquid crystal displays, and five papers with a variety of topics: dye diffusion thermal printing, ceramics, rare earths, polyurethane resins, and materials for optical data storage. The last day of talks involved liquid crystal polymers, high temperature superconductors, molecular materials and three papers on non-linear electro-optic materials. The poster presentations were concerned with the same topics as the invited papers.

The authors who discussed liquid crystal displays (LCD) predicted that LCDs will dominate the 1990s and by the late 1990s the number of LCDs manufactured per year will surpass the number of CRT (cathode ray tubes) built per year. Mr. F. Funada of Sharp Corp., Nara, Japan, predicted that 64 M and 1 G bit DRAM memories will be available by 1995 and 2000, respectively. The final speaker at the conference gave an extremely interesting presentation concerning the status (which is small) and the prospects (which are extremely optimistic) for molecular scale electronics. During the symposium, the editor presented an invited paper on "Rare Earths in the Electronics Industry;" copies are available from RIC.

RE DEPOSITS

A recent report published by the U.S. Bureau of Mines entitled *Columbium-and Rare-Earth Element-Bearing Deposits at Bokan Mountain, Southeast Alaska,* is authored by J. Warner and J. Barker. The report concerns rare-earth elements (REE) and associated minerals and their occurence at the site. The report summarizes the mineral evaluations and estimates the indicated and inferred resources of these deposits containing significant tonnage and grade. The report indicates that 61,000 mt Y_2O_3 and 110,000 mt of other rare earth oxide (REO) are present at concentrations of more than 0.5 percent in over 80 percent of the total resource tonnage. The rare earth element resources occur mostly in mineralized dikes with the minerals containing niobium, beryllium, tantalum, and zirconium, whereas uranium bearing minerals occur in fracture-related deposits. A substantial part of the deposit contains over 0.12 percent tantalum and niobium.

(Continued on page 8)

Record-Setting Superconductor

A world record for electrical current carried by a practical high-temperature superconductor device was set last May at Argonne National Laboratory. In a joint venture by Westinghouse Science and Technology Center (STC), Pittsburgh, and the U.S. Department of Energy's Argonne National Laboratory near Chicago, tests showed that a composite electrical lead made of silver and yttrium-barium-copper oxide carried 2,000 amperes of current, twice as high as its 1,000-ampere design rating and nearly 10 times higher than current previously reported for power devices using high temperature superconductors.

The Westinghouse-Argonne lead is about 64cm long and 7.4cm in diameter. It uses an array of 17 rectangular bars made from a composite of silver and the high-temperature $YBa_2Cu_3O_{7-x}$ superconductor, yttrium-barium-copper oxide. At 2,000 amperes the current density of the superconductor is about 250 amps/cm^2 and a magnetic field of 180 gauss is generated. Experimental results of the helium boil-off measurements show a heat leak of 0.7 watts/1,000 amps, 40 percent lower than conventional leads.

In many superconducting power devices, a large fraction of operating cost pays for refrigeration to recondense boiled-off helium. By using high temperature superconducting ceramics in the low-temperature part of the lead, the Westinghouse-Argonne lead has the potential to reduce helium boil-off to one-twentieth of that experienced with conventional leads. The ceramics, because they operate in a temperature range where they are superconductors, virtually eliminate resistive heating.

CONFERENCE CALENDAR

REE in Processes of Petrogenesis
Tashkent, USSR
September 1990
RIC News, **XXIV,** [2] 2 (1989)

5th International Conference on Physics of Magnetic Materials (5ICPMM)
Madralin, Poland
October 9-12, 1990
RIC News, **XXIV,** [4] 2 (1989) and *RIC News,* **XXV,** [1] 2 (1990)

11th International Workshop on Rare-Earth Magnets and Their Applications and 6th International Symposium on Magnetic Anisotropy and Coercivity in Rare Earth-Transition Metal Alloys
Pittsburgh, Pennsylvania, U.S.A.
October 21-25, 1990
RIC News, **XXIV,** [4] 2 (1989)

Second Indo-USSR Symposium on Rare Earth Materials Research
Trivandrum, India
November 5-7, 1990
* *This Issue*

Rare metals '90
Kokura, Kitakyushu, Japan
November 14-16, 1990
RIC News, **XXIV,** [4] 2 (1989)

International Conference on Rare Earth Minerals and Minerals for Electronic Uses
Hat Yai, Thailand
January 23-25, 1991
RIC News, **XXV,** [2] 2 (1990)

The Magnetic Bearings and Dry Gas Seals Conference and Exhibition (ROMAG '91)
Washington, D.C., U.S.A.
March 13-15, 1991
RIC News, **XXV,** [2] 2 (1990)

Journées des Actinides
Lagos, Algarve, Portugal
April 28-May 1, 1991
RIC News, **XXV,** [2] 2 (1990)

2nd Workshop on the Basic and Applied Aspects of the Rare Earths
Venezia, Italy
May 10-11, 1991
* *This Issue*

Second International Conference on Rare Earth Development and Applications (2nd ICRE)
Beijing, China
May 27-31, 1991
RIC News, **XXV,** [2] 2 (1990)

19th Rare Earth Research Conference (19th RERC)
Lexington, Kentucky, U.S.A.
July 14-19, 1991
RIC News, **XXV,** [1] 2 (1990)

Rare Earths '92 in Kyoto
Kyoto, Japan
June 1-5, 1992
* *This Issue*

* *News Story This Issue*

Second Indo-USSR Symposium

Under the Indo-Soviet collaborative program, the first bilateral symposium on rare earth materials was held at Talin, USSR, in 1988. The second symposium is to be held at the Regional Research Laboratory (CSIR), Trivandrum, India, November 5-7, 1990.

Basic and applied aspects of rare earths will be presented in the following topics: geochemistry; processing and production; materials science and technology including industrial applications, magnetic and optoelectric materials, coordination chemistry, variable valency, analysis and spectroscopy, and rare earth based high Tc materials.

The symposium is sponsored by the Indian National Science Academy and the U.S.S.R. Academy of Sciences. All correspondence should be addressed to Dr. A.D. Damodaran, Convener, Indo-Soviet Symposium on Rare Earths, Regional Research Laboratory (CSIR), Trivandrum 695 019, Kerala, India. Tel:75324/76774, Telex:0435 232.

Fluoride Glasses

The RIC has received volume 27 of *Critical Report on Applied Chemistry,* entitled *Fluoride Glasses.* The 219-page book is edited by Alan E. Comyns and contains 9 chapters, 8 of which give a great deal of information on the rare earth-containing fluoride glasses.

The purpose of the book is to cover all those glasses composed entirely of fluoride anions and metal cations. The emphasis is on the heavy metal fluoride glasses, which were discovered in 1974, with reference made to earlier work on other fluoride glass systems. Following a brief introduction that includes history, nomenclature, technical problems, and status and outlook, the topics presented include glass systems and structures, nucleation and crystallization, raw materials, optical properties and applications, general physical properties, chemical properties, fibre drawing, and applications and prospects.

The cost of this book is U.S.$89.95 and may be ordered from John Wiley & Sons, Inc., 605 Third Avenue, New York, New York 10016.

SAMARIUM was discovered in 1879 by Lecoq de Boisbaudran.

Ferromagnetic Materials

Volume 4 of *Ferromagnetic Materials-a Handbook on the Properties of Magnetically Ordered Substances* is a comprehensive guide to the field of magnetism. The book is intended to serve two functions. As a textbook it introduces any given topic in the field of magnetism without requiring any reading of the vast amount of literature now on the subject. As a reference book, it contains topical review articles written by leading scientists. In each of the articles an extensive description is given of material properties in graphical and in tabular form and emphasis is placed on the discussion of the experimental material in the framework of physics, chemistry, and materials science.

The five chapters provide readers with an insight into modern trends in magnetism and new achievements in this area. Topics covered include amorphous magnetism, permanent magnets, and magneto-optics. The chapters also include more traditional areas such as the magnetism of alloys and compounds of 3*d* and 4*f* elements, using the more sophisticated techniques available today.

The book is 653-pages long and includes author, subject, and materials indices. It also contains the many graphs and tables that give fundamental information on the permanent magnets. This book is one of the finest that we have seen on this subject and will find much use in the office or laboratory.

The book can be yours for US$158.00 by contacting Elsevier Science Publishing Co., Inc., P.O. Box 882, Madison Square Station, New York, New York, 10159 USA.

Rare Earths in Kyoto

The International Conference on Rare Earths will be held in Kyoto, Japan, from June 1-5, 1992. 1992 is the 10th anniversary of the Rare Earth Society of Japan and the conference is one of its commemorative activities. The conference is intended to cover a wide spectrum of topics and problems of rare earth sciences and technologies.

The conference will include the main themes of: physics, chemistry, spectroscopy, phosphors and lasers, minerals separation technology, metallurgy, materials science, magnetics, hydrogen storage materials and batteries, catalysts, and problems of

(Continued on page 6)

1990 Shiokawa Award

The Shiokawa Award of the Rare Earth Society of Japan was made in May to Professor Gin-ya Adachi of Osaka University, Department of Applied Chemistry. He received the award for his studies on the preparation and properties of divalent europium compounds, which are complexes of crown ethers, cryptands, polycrown ethers, and inorganic complexes of boron oxides.

Professor Gin-ya Adachi developed blue emitting Eu(II) polymer phosphors using polycrown ethers. This phosphor is the first example of blue emitting Eu(II) polymer complexes. He also invented the new X-ray phosphor $Ba_2B_5O_9:Eu_{2+}$, for which a Japanese patent has been awarded (JP 55/48280, April 1980). This phosphor is one of the key materials for the photostimulated luminescence system.

His group has been engaged in CO_2 sensors, hydrogen storage alloys, and a new method of separating rare earths.

He is currently organizing an international conference on rare earths in 1992 in Kyoto, Japan (this issue), and is the general secretary of the Rare Earth Society of Japan.

Matthias Memorial Award

Theodore H. Gabelle of Stanford University is the winner of the first Bernd Matthias Memorial Award, a $5000 prize established by AT&T in honor of Bernd Matthias, whose lifelong association with Bell Labs began in 1948, shortly after he came to the United States from Switzerland. The award recognizes achievements made in high-temperature superconductivity.

Theodore Gabelle was presented with the award on July 25, 1989, in Palo Alto, California, at an international conference on materials and mechanisms of superconductivity. The prize was given in recognition of Gabelle's "... distinguished career in technical leadership and contributions to the field of superconductivity."

Gabelle is well known for his research in low-temperature physics, superconductivity, and materials science. He and Matthias were jointly honored with the Oliver J. Buckley Prize in 1970 by the American Physical Society.

Meritorious Honor Award

The 1990 (48th) Meritorious Honor Award of the Japan Institute of Metals (J.I.M.) was presented to Professor Kôki Ikeda of Iwate University, Morioka, Japan. Dr. Kôki Ikeda received the award at the spring meeting of the J.I.M. on April 4, 1990, for his work in the field of materials physics.

Professor Kôki Ikeda has studied the electrical and magnetic properties of materials containing the transition and rare earth elements by measuring the electrical resistivity, low temperature heat capacity, and magnetization. The studies include: (1) the effect of magnetic field on the spin fluctuations, (2) the correlation between the electrical resistivity and magnetism, (3) the influence of the lattice faults to the magnetic properties, and (4) the origin of the high upper-critical field in the ceramic superconductors.

Dr. Ikeda's many achievements in the basic field of materials physics include the discovery of the unusual decrease of the electronic heat capacity and electrical resistivity in the weakly and nearly ferromagnetic materials, Sc_3In, $LuCo_2$, and others. This decrease is caused by the quenching of spin fluctuations.

The RIC is proud of the accomplishments of Professor Kôki Ikeda as he was a visiting scientist at Ames Laboratory from 1978-1980.

The Rare Earths 25 *and I* 25

As our 25th year comes to a close, more personal, rare earth related stories continue to arrive at RIC. We are hoping that readers continue to send us their stories so that we may publish a booklet containing all those received.

This personal account was sent to Dr. Karl Gschneidner, Jr., director, Rare-earth Information Center by Dr. Tony Bagshaw, coordinator, Agricultural and Mineral Development, Department of Mines, Western Australia.

I first started working on rare earths during my graduate studies at the Inorganic Chemistry Laboratory, University of Oxford, England, under the supervision of Professor J.S. Anderson. The first copy of the *RIC News* that I received was volume 2, No. 3 (1 September 1967).

My doctoral programme involved determining the thermodynamic properties of rare earth carbides, and I attended a conference in Paris in May 1969 to present some of the work. This international conference was sponsored by the French National Centre for Scientific Research and was reported in *RIC News*, 4, No. 3. Professor Anderson was absent in the U.S.A., so it was left to me to present the paper. Being my first big conference and a young graduate I was very nervous. However, he advised me to seek out a person who would be very helpful and be able to calm my nerves. This person was you! We met, you were very helpful and I enjoyed the conference. This is, I believe, the one and only time we have ever met.

I subsequently worked in the U.S.A., New Zealand, and am now involved with the mining industry in Western Australia. My association is less direct these days, but we are trying, with our large monazite reserves and production, to develop rare-earth processing industries here. Rhône-Poulenc is particularly close to achieving this.

I have continued to receive the *RIC News* over the past 20 years. I thoroughly enjoy the articles and the style in which they are presented. Congratulations to you and all the staff for producing such a useful newsletter—long may it continue.

SAMARIUM was named after colonel M. Samarski, a Russian mine official.

25 *Highlights From Past RIC News* 25

The third of a series of selected articles from past issues of the *RIC News* includes the following story, which appeard in Vol. III, No. 2, June 1, 1968. With the cessation of AEC funding for the Rare-earth Information Center, all operations of the RIC would have been discontinued with the last issue of the March 1, 1968 *RIC News*. It was only the grants from industry that allowed the center to operate to this day.

RIC News To Continue

Although RIC has discontinued operations as an AEC information center, *RIC News* will be published for at least another year by Iowa State University's Institute for Atomic Research.

The extension of *RIC News* was made possible through industrial grants to the Institute by five rare-earth producers. The cooperating firms are American Potash & Chemical Corp., a subsidiary of Kerr-McGee; W.R. Grace & Co.; Molybdenum Corporation of America; Research Chemicals Division, Nuclear Corporation of America; and Ronson Metals Corporation.

Under the arrangement the industrial grants will be used to defray production and mailing costs, and a portion of the editorial and production staff support of *RIC News*. The institute will provide the remaining support.

Continuation of *RIC News* ensures the rare earth research and production community a publication for the interchange of ideas and information. No changes in format or editorial policy are anticipated at this time, according to Editor K.A. Gschneidner, Jr. The "Rare Earthers Around-the World" stories will continue and readers are urged to submit contributions for this feature.

Although this Newsletter will continue to be published, the other functions of RIC, such as answering inquiries and compiling bibliographies will not be resumed.

Reduction in this year's federal appropriations forced the AEC to withdraw support of the RIC, which it had established at the Ames Laboratory, Iowa State University in 1966 (*RIC News*, Vol. III, No. 1, March 1968).

Binary Structures

The second volume in the *Cohesion and Structure* series has the title *The Structures of Binary Compounds*, F.R. deBoer and D.G. Pettifor, eds.

The seven contributing authors present topics in four chapters: "Environment Classification and Structural Stability Maps;" "Crystal Coordination Formulas: a Flexible Notation for the Interpretation of Solid-state Structures;" "Quantum Theory of Structure: Sp-bonded Systems;" and "Quantum Theory of Structure: Tight-Binding Systems." Of special interest to rare earthers are the rare earth systems that are represented throughout the volume with structure types sorted alphabetically and according to the Pearson symbol.

The purpose of this volume is two-fold: present the most comprehensive compilation of the experimental data on the structures of binary compounds, and describe the recent theoretical advances in the quantum-mechanical origin of structural stability.

The successful ordering of the known experimental data are shown in detail in two- or three-dimensional colored structure maps. Of special interest to workers in the field is the inclusion of 150 of the most frequently occuring structure types being characterized by their local coordination polyhedra.

The success of first-principles theoretical calculations within the Local Density Approximation (LDA) is explained in predicting the correct ground-state structures of binary semiconductors, insulators, and metals.

The 382-page book was published in 1989 by Elsevier Science Publishers B.V. and is available by writing to the publishers, P.O. Box 211, 1000 AE Amsterdam, The Netherlands. In the U.S. or Canada contact the publishers, P.O. Box 882, Madison Square Station, New York, New York, 10159. The cost of the Book is U.S.$136.00.

RE Workshop

The 2nd Workshop on the Basic and Applied Aspects of Rare Earths will be held in Venice, Italy, May 10-11, 1991. For more information contact: Dr. P.A. Vigato, 1st. Chim. Technol. Radioelementi, CNR Padova, Venice, Italy Tel:(+3949)845 362 Fax:845449.

Photoemitted Electrons

Extremely bright electron beams can be produced by laser irradiation of semiconducting photoemitters, but present photoemitters are sensitive to contaminants and degrade during operation. Advanced accelerators demand a more rugged material for laser-driven photoemitters. P. Oettinger [*Appl. Phys. Lett.* **56,** 333-4 (1990)] measured the brightness of photoemitted electron beams from an irradiated LaB_6 sample after heating the surface to 1700 K in order to remove surface oxide contaminants. Measurements show that LaB_6 is less susceptible to air contamination than currently used Cs_3 Sb, and LaB_6 provides a somewhat less intense electron beam. Oettinger found that trains of short electron groups needed in free-electron lasers could be generated by irradiating LaB_6 with a Nd:YAG laser.

SHARE

Spectroscopic Happenings on Actinides and Rare Earths (SHARE) is a free service established to promote discussion among members of the rare earth spectroscopy community. An electronic mail BITNET discussion LIST named SHARE-L has been set up on the French node FRORS12. Drs. Michele Faucher and Denis Garcia, both of CNRS will manage the list on their computer system.

Each message sent to the LIST is automatically forwarded to all subscribers. Therefore, if you want to ask questions, or express opinions about anything connected with rare earth spectroscopy, this is a quick way to communicate with a large number of people.

To subscribe to the list send an Electronic Mail message to: LISTSERVE@FRORS12.BITNET. The body of the message should contain the single line: SUB SHARE-L (your full name). Remember that this is a program, not a person. If you need personal help contact the following: Drs. Michele Faucher and Denis Garcia CNRS, MEUDON Bellevue, UTSBOO@FRORS12.BITNET.

This list already has over 50 subscribers and is continually growing. SHARE'S hope is that this list will encourage users to exchange information about experiments, computer software, meetings, and so on.

RE Catalysts

A new series of ruthenium-based catalysts discovered by A. Ashcroft *et al.* [Nature, 344, 319 (1990)] were found to have a high activity and selectivity for converting methane to synthesis gas. Normally, the reaction for the partial oxidation of methane to produce synthesis gas occurs at about 1,200°C, but with the use of these new catalysts the conversion can be conducted at about 775°C. These new catalysts which have the $Ln_2Ru_2O_7$ composition are analogues of rare earth/tin oxides. The authors have found that the $Ln_2Sn_2O_7$ are good catalysts for the oxidative coupling of methane to ethylene.

The partial oxidation reation $CH_4 + ½O_2 \rightarrow CO + 2H_2$ is exothermic and produces an unusually low H_2/CO ratio in contrast to most synthesis gas generating reactions in which the CO reacts with the O_2 to produce the unwanted CO_2. The advantage lies in future commercial operations where a second stage reactor that is currently used to lower the H_2/CO ratio can be eliminated.

Ashcroft and co-workers, who conducted the work at Oxford's Chemical Crystallography Laboratory, were supported by the Gas Research Institute, Chicago. This research is of interest to producers utilizing catalysts in methane and petroleum products conversion, and gasification of coal.

The catalysts produced by the researchers are polycrystalline mixed oxides. Their selectivity for synthesis gas increases with temperature and a tendency to form carbon monoxide, rather than carbon dioxide is dominant above 693°C. Thus, if the available oxygen is insufficient to convert all of the methane to carbon dioxide, the formation of synthesis gas is entropically favored.

Methane conversion exceeds 90 percent with the nitrogen diluent with selectivities above 94 percent for all of the $Ln_2Ru_2O_7$. Without the nitrogen diluent, conversions were lower but selectivity was still high.

Merger

Mitsubishi Metal Corp. and Mitsubishi Mining and Cement Corp. will merge this December. The name of the new company will be Mitsubishi Materials Corp. The value of the new company is estimated to be over 900 billion yen ($6 billion).

Manufacturing Bulk Superconductors

R. Meng and co-workers have developed a continuous process for fabricating bulk superconductors with a predetermined grain orientation [(*Nature,* **345** 326-8 (1990)]. The authors report that a 5 × 0.5 × 0.3cm bar of the superconducting $YBa_2Cu_3O_7$ was produced by a continuous process. The bulk 1-2-3 superconductor obtained from the process has magnetically determined J_c's (critical current densities) of 3×10^4 and 1.2×10^4 A/cm² at zero and 1T, respectfully and transport J_c's of 2×10^4, 1.1×10^4, and 7.5×10^3 A/cm² at zero, 0.54, and 0.83T.

The bar was sintered from a 1-2-3 fine-powder precursor at about 950°C for 24 hours in an oxygen atmosphere to obtain ≥90 percent of the theoretical density, 6.3 g/cm³. The bar was then heated to about 1,100°C for a short time before it was cooled rapidly to near the peritectic temperature (1,050°C). The sample was then slowly peritectically solidified. Because of the narrow hot zone, zone refining occurs along the axis of travel depositing Y_2BaCuO_5 at one end of some of the samples. Pieces from different parts of the bar were oxygenated at 500°C for 24-48 hours. Scanning electron micrographs show that there is excellent grain alignment throughout the bar.

The authors add that at present, this process is slow, but by varying the processing parameters and possibly the composition of Y-Ba-Cu-O material through doping, they expect to increase the speed of the grain growth.

Stamp Contest

This is the final reminder to readers that the RIC stamp contest ends September 17, 1990. All entries must be postmarked by September 17, 1990, and received by October 1, 1990. As mentioned in the December 1, 1989, issue of the *RIC News,* the person who identifies the most worldwide postage stamps that have a direct relationship to the rare earths will be offered a choice of one of the books that the editor has available or a free subscription to *RIC Insight.*

We extend our thanks to all those persons who have helped us celebrate our 25th year by sending us their entries. The winner will be announced in the December 1, 1990, issue of the *RIC News.*

MRS Proceedings

Microstructure-Property Relationships in Magnetic Materials is one of 14 volumes of the *Proceedings of the First Materials Research Society International Meeting on Advanced Materials* (IMAM), which was held at Sunchine City, Tokyo, Japan, from May 30 to June 3, 1988.

IMAM Volume 11, *Microstructure-Property Relationships in Magnetic Materials,* published in 1989, was edited by M. Homma and Y. Imaoka. It has 317 pages and includes 26 papers. This book contains topics on microstructure-property relationships in hard magnetic materials, soft magnetic materials, magnetic recording media, ranging from fundamental aspects such as theoretical considerations, microstructural characterization, through technological issues such as material fabrications. It contains 6 papers on Nd-Fe-B permanent magnets and 3 papers on Sm-Co permanent magnets. In addition, it explains the structural properties and magnetism in TbFeCo thin films and magneto-optical alloys.

This book will serve as a textbook for students as well as a reference for researchers who wish to know the microstructural evolution in various magnetic materials.

This book is available from Materials Research Society, 9800 McKnight Road, Suite 327, Pittsburgh, Pennsylvania 15237 U.S.A. The cost of the book to MRS members is U.S.$40.00 (nonmembers U.S.$50.00 in the U.S., others U.S.$60.00).

Oxygen Sensor

An oxygen sensor that operates at room temperature was reported by J. P. Lukaszewicz, N. Miura, and N. Yamazoe in *Japn. J. Appl. Phys.,* **28,** L711-3 (1989). These authors report on the use of single crystal LaF_3 with various oxides as oxygen sensors. The cell is made up of platinum mesh to which one electrometer lead is attached, the sensing oxide electrode, single crystal LaF_3, and a reference electrode (Sn + SnF_2 mixture) to which the other lead is attached. The perovskite electrodes, $LaCrO_3$, $LaMnO_3$, $LaCoO_3$, $La_{0.6}Ca_{0.4}CoO_3$, $La_{0.8}Ca_{0.2}MnO_3$, and $LaFeO_3$ were studied and compared to Pt-black sensing electrodes. $LaCrO_3$ appears to be the best choice for a short-response time (3 to 5 minutes for 90 percent response) and sensitivity.

MPV Lanthanides

A newly formed company, MPV Lanthanides, Inc., a consortium of three individual groups, China *M*etallurgical Import and Export, *P*acific Chemicals and Engineering, and Universal *V*ictory, Incorporated, is now offering rare earth related products and services. MPV currently offers rare earth oxides and fluorides available for industrial and research applications. For more information contact Philip P. Choban at the corporate offices, 24371 Lorain Road, Suite 202, North Olmsted, Ohio 44070, U.S.A. Tel:(216)779-4260 Fax:(216)779-6005.

Ronson Metals Closes

Ronson Metals Corp., Newark, New Jersey, which manufactured rare earth metals for industrial use since 1915, announced that it would cease operating this year and that its assets would be sold. Ronson Metals, once the largest company of its kind, closed its doors July 1, 1990.

Ronson Metals incurred sizable losses in recent years with the decline of the U.S. steel industry. Ronson Metals, a subsidiary of Ronson Corp., produced flints for lighters and industry and also marketed mischmetal to the steel industry. Mischmetal is used as a metallurgical additive for desulfurizing steel and zinc plating. According to the company, Ronson's Consumer Products division will seek alternative flint sources for its products. The sale of the company's assets is expected to equal or exceed the operating losses for this year.

Ronson Metals has been a supporter of the Rare-earth Information Center for the past 22 years, for which we have been extremely thankful.

(Continued from page 2)

rare earth industries. The proceedings of the presented papers will be available at the meeting. English will be used throughout the conference.

For more information contact Professor Gin-ya Adachi, Department of Applied Chemistry, Faculty of Engineering, Osaka University 2-1, Yamadaoka, Suita, Osaka, 565, Japan, Tel:(06)877-5111 ext. 4251 fax:(06)876-4754.

MINING WITH MAGLEV

The West German company, AEG Magnetbahn, is currently developing a magnetic levitation (maglev) system for use in underground coal mining. The mining system being developed uses permanent Nd-Fe-B magnets with much the same technology as the mass transportation systems currently under development at the Las Vegas and the Frankfurt airports.

The coal-mining system, known as the Integrated Transport System (ITS), is being developed for the German mining company Ruhrkohle AG and is receiving support from the West German Ministry of Research and Technology. ITS was displayed at the Hanover Trade Fair in West Germany with a demonstration line that was 85 meters long and climbed to a height of 5.5 meters with a maximum incline of 22 percent (about 13° from horizontal). The coal gets off the ground by magnets produced by Vacuumschmelze GmbH.

Superconducting Powders

The G. Frederick Smith Chemical Company, now known as GFS Chemicals, is announcing the addition of superconducting powders to their product line. The entire inventory of superconducting materials that once belonged to W.R. Grace & Co. has been puchased by GFS. In addition, Grace's proprietary process for making superconducting powders has been transferred to GFS.

The superconducting powders were developed at Grace's Washington Research Center. These powders are produced through the wet chemical processing of yttrium, barium, and copper oxides of three and four nines purity. These oxides are dissolved in nitric acid and coprecipitated to achieve the ideal stoichiometry and particle requirements. The end product has a consistently high superconducting phase purity of 98 to 100 percent.

The majority of the materials produced by GFS are high purity inorganic salts, acids, and rare earth salts. For more information contact: GFS Chemicals, Inc., ATTN: J. Steel Hutchinson, P.O. Box 245, Powell, Ohio 43065 U.S.A. Tel:1-800-858-9628 Fax:1-614-881-5989.

AJ Ventures

The U.S. trading company, AJ Ventures, Inc., is now offering rare earth oxides and concentrates from the Soviet Union for sale in the United States and world markets. The Soviet foreign trade system has abolished the state monopoly on foreign trade and is giving new freedom for Soviet producers to integrate themselves into world markets.

AJ Ventures has offices in Ojai, California, Sharon, Massachusetts, and Moscow, U.S.S.R. The president, Mr. Arnold Freeman, tells us that yttrium oxide, yttrium oxide concentrate, terbium oxide, and gadolinium oxide can be ordered through the principle office at: One Partridge Hill, Sharon, Massachusetts 02067 U.S.A. Tel:(617)784-1116 Fax:(617)784-1736.

REMACOR

Reactive Metals & Alloys Corporation (REMACOR), West Pittsburgh, Pennsylvania, announced the appointment of Applegate Group, Inc. as new sales representative. Applegate Group will market in North America and Mexico REMACOR's rare earth metals, which include mischmetal, rare earth silicide, pure rare earth metals, and other rare earth metal alloys.

REMACOR's plant in West Pittsburgh is the only mischmetal production facility operating in North America. During the 1970s and 80s, the company developed innovative metallurgical practices, techniques, and products for the application of rare earths for steel production. REMACOR is still actively involved in the research and development in the treatment of continuously cast steel with rare earths, and in the technical development of other non-ferrous uses for rare earths. For more information contact Mr. W.A. Otis, president, Applegate Group, Inc., Park Eighty West, Plaza II, Suite 200, Saddle Brook, New Jersey 07662 Tel:(201)368-1325 Fax:(201)368-1328.

Indian Rare Earth Ltd.

RIC has learned that Mr. R.K. Garg has retired as the chair and managing director of Indian Rare Earths Ltd. Mr. Garg retired April 6, 1990, and was replaced by Mr. K. Subramanian, technical director of the company.

CATEGORIES OF SUPPORT

In July 1990 RIC inaugurated a new policy to better recognize those companies or organizations who contribute more than the minimum level of support ($300). We have initiated the following six categories of support:

Subscriber — less than $400;
Sustaining — $400 to $900;
Patron — $1000 to $1999;
Sponsor — $2000 to $3999;
Donor — $4000 to $9999; and
Benefactor — $10,000 or more.

For those who do not wish to have their level of support disclosed we have a seventh category entitled, "Level of Support Not Disclosed", however, only those companies that contribute $400 or more are eligible for this category. We will still maintain an Anonymous category for those companies who wish that their support remain undisclosed (there were four companies in this category in fiscal year 1990). In each issue of the *RIC News* all companies who have contributed during the preceding quarter will be acknowledged under the appropriate category.

When the next brochure is prepared and printed only those companies who contribute $400 or more will be listed in the appropriate category in our brochure. This is being done because space limitations do not permit us to list the companies in the Subscriber Category. Note: we will make the entire list of benefactors available (except for anonymous ones) upon request. Furthermore, as noted above all companies in the Subscriber category will be listed once each year in the *RIC News*.

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Telephone: (515) 294-2272
Telex: 269266
Facsimile: (515) 294-3226
BITNET: RIC@ALISUVAX
K.A. Gschneidner, Jr ..... Editor
Joel Calhoun ..... Staff Writer

Rare Earths at Port Pirie

A new rare earth processing plant is being built at Port Pirie, South Australia, just west of the Flinders Ranges and in the heart of Australia's "Iron Triangle". Melbourne-based SX Holdings Ltd, is building the $50 million rare earths processing plant. Start-up of the plant was the first of three phases of a major project planned to save milions of dollars each year in export costs. The three phases include:

- Reprocessing about 200,000 tons of uranium tailings that are rich in rare earths, especially scandium. The tailings are already onsite, the result of uranium production between 1955 and 1962. This phase is expected to start shortly.
- The building of another facility to separate yttrium and other elements from imported rare earths.
- A cracking plant to extract rare earths from the mineral monazite, the product of beach sand mining. An environmental impact statement is being prepared because a by-product of this process is the production of low-level radioactive thorium.

The first stage of the project is not expected to be particularly profitable, but the processing of monazite could earn up to $30 million per year. Australia is the largest producer of monazite, accounting for more than 40 percent of the world production. Australia is the only major producer not conducting secondary production of monazite, which increases its value. Currently, 96 percent of Australian monazite is exported to Europe for refining.

Lanthanum in Cells

The effects of lanthanum and its compounds on cellular systems are of considerable interest because of their increasing use in industry and as a substitute or antagonist for calcium in a variety of cellular reactions. Lanthanum is also being employed extensively in studying, anatomical barriers, membrane structure, and subcellular transport systems, particularly the calcium pathway. For these reasons T. Das, A. Sharina, and G. Talukder wrote "Effects of Lanthanum in Cellular Systems," which appears in *Biological Trace Element Research*, **18**, 201-28 (1988).

After short discussions on La in bacteria and plants the majority of the paper is devoted to La in animal systems. Sections are included on the effects of La on the circulating system, including heart muscle; the nervous system; the skeletal and smooth muscles; the excretory systems; the liver; other parts of the animal system; and on DNA and nuclei. The review has a bibliography with 222 entries.

CERIUM was named after the newly sighted asteroid Ceres in 1803.

ERES

An organization called the European Rare Earth and Actinide Society (ERES) was formed in August 1989 and has headquarters in Lausanne, Switzerland. ERES was established to encourage the development of scientific and technological activities in the field of the *f*-elements, with special reference to European and neighboring countries. The goals of ERES are:

- Exchange of professional, technical, industrial, and economic information.
- Promotion of educational and research activities at the European level.
- Organization of a triennial international conference on *f*-elements (ICFE) in coordination with other similar conferences throughout the world.
- Maintenance of close contact with similar societies and organizations around the world including national and international bodies interested in subjects involving *f*-elements.

In addition, ERES also publishes a four-page newsletter that includes happenings in the field of rare-earths and actinides, and includes a calendar of planned conferences and workshops on *f*-elements.

For information concerning enrollment into ERES or to receive the *ERES Newsletter*, contact: J.-C.G. Bunzli, Inst. Chim. Min. Anal., Place du Chateau 3, CH-1005 Lausanne, Switzerland.

SUPPORTERS

Since the beginning of the fiscal year July 1, 1990, RIC has received support from 6 new family members, and renewed support from 47 of our regular members. Thus, 53 pledges of support have been received since our fiscal year began.

In order to recognize those companies or organizations who contribute more than the minimum level of support (for new subscribers it is $300), we have initiated six categories of support (see below). For those who do not wish to have their level of support disclosed we have a seventh category entitled, "Level of Support Not Disclosed," however, only those companies which contribute $400 or more are eligible for this category. We will still maintain an "Anonymous" category for those companies who wish that their support remain undisclosed.

The supporters wishing to be listed, grouped according to their appropriate category, and with the number of years they have contributed to the Center in parentheses, are listed below.

Benefactor ($10,000 or more)

Donor ($4000 to $9999)
- Molycorp Incorporated, A Unocal Company, U.S.A. (23)

Sponsor ($2000 to $3999)
- CERAC, Incorporated, U.S.A. (15)
- Indian Rare Earths Limited, India (22)
- Mitsubishi Kasei Corporation (17)
- Shin-Etsu Chemical Company, Limited, Japan (21)
- Wako Bussan Company, Limited, Japan (22)

Patron ($1000 to $1999)
- Ford Motor Company, U.S.A. (4)
- Santoku Metal Industry Company, Limited, Japan (21)
- Treibacher Chemische Werke AG, Austria (19)

Sustaining ($400 to $900)
- Crucible Materials Corporation, U.S.A. (17)
- Ferro Corporation, U.S.A. (15)
- Haynes International Incorporated, U.S.A. (8)
- Hitachi Magnetics Corporation, U.S.A. (16)
- Hunan Research Institute of Rare Earth Metals, People's Republic of China (3)
- I G Technologies Incorporated, U.S.A. (3)
- Iron Ore Company of Canada, Canada (8)
- Johnson Matthey Electronics-Rare Earth Products, U.S.A. (3)
- Kilborn, Incorporated, Canada (1)
- Nippon Mining Company, Limited, Japan (2)
- Sumitomo Light Metal Industries, Limited, Japan (7)
- UGIMAG RECOMA AG, Switzerland (6)
- USR Optonix, Incorporated, U.S.A. (20)
- Yue Long Chemical Plant, People's Republic of China (10)

Subscriber (less than $400)
- A/T Products Corporation, U.S.A. (11)
- Albright & Wilson Americas, U.S.A. (3)
- Ames Research Center—NASA, U.S.A. (3)
- Aran Isles Chemicals Incorporated, U.S.A. (7)
- Arnold Engineering Company, U.S.A. (6)
- Can-Pacific Rare Earths and Metals Corporation, Canada (2)
- CANMET, Canada (4)
- Christensen Technologies, Incorporated, U.S.A. (1)
- Edge Technologies Incorporated, U.S.A. (2)
- Eveready Battery Company, U.S.A. (2)
- Hermann C. Starck Incorporated, U.S.A. (5)
- Johnson Matthey Electronics, U.S.A. (3)
- Lanthanide Research Corporation, U.S.A. (7)
- Martin Marietta Energy Systems Incorporated, U.S.A. (3)
- Matsushita Electric Industrial Company, Limited, Japan (6)
- Mitsubishi Metal America Corporation, U.S.A. (3)
- MPV Lanthanides, Incorporated, U.S.A. (1)
- Neomet Corporation, U.S.A. (5)
- Nikko Trading Corporation, U.S.A. (3)
- Nippon Rare Earths Company, Limited, Japan (2)
- Nippon Yttrium Company, Limited, Japan (12)
- North-Holland Physics Publishing (a Department of Elsevier Science Publishers), The Netherlands (3)
- Nuclear Reseach Center—Negev, Israel (1)
- Reactor Experiments Incorporated, U.S.A. (21)
- Sausville Chemical Company, Incorporated, U.S.A. (3)
- Scheller Handel AG, Switzerland (1)
- Sherritt Gordon Limited, Canada (7)
- The Society if Non-Traditional Technology, Japan (2)
- Ushio Incorporated, Gotenba Plant, Japan (1)

Level of Support Not Disclosed
- Department of Industry, Technology and Commerce, Australia (4)

(Continued from page 1)

Bokan Mountain, approximately 60 kilometers to the southwest of Ketchikan, Alaska, was intensively investigated during the summers of 1984 through 1987 in order to assess Alaskan reserves of strategic minerals or metals (including niobium) that could be extracted during periods of prolonged national shortage. Currently, the U.S. is entirely reliant on foreign resources of niobium. To receive a copy of the report, contact James C. Barker, United States Department of the Interior, Bureau of Mines, 794 University Avenue, Fairbanks, Alaska 99709

Rare-earth Information Center
Ames Laboratory
Institute for Physical Research and Technology
Iowa State University
Ames, Iowa 50011-3020