Rare-earth Information Center NEWS

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Iowa State University, Ames, Iowa 50011-3020 U.S.A.

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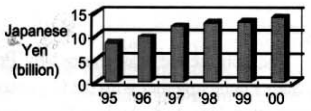
Santoku Corporation

Santoku Corporation, with headquarters in Kobe, Japan, is one of the leading manufacturers of rare earth metals and alloys in the world. Santoku provides rare earth products for various markets, including NdFeB and SmCo alloys for permanent magnets, hydrogen absorption alloys for NiMH batteries, flints for lighters, and rare earth metals, such as Y, La, Tb, etc., and mischmetal for metallurgical applications. In addition to its rare earth business, Santoku also produces zirconium compounds for catalyst and electronics applications and lithium compounds for Li-ion batteries.

For more than 50 years, Santoku has been a leader in the development of state-of-the-art technology for the production of high-quality rare earth metals and alloys. It currently has three large manufacturing sites in Japan, in Kobe, Miki, and Akashi, and one in the US under the name of Santoku America, Inc. in Phoenix, Arizona. It also has a branch business office in Tokyo.

Sales Turnover



Santoku's product quality, customer service, and recent technological innovations have led to a significant increase in sales over the past several years. As shown in the graph above, sales turnover has increased by approximately 70% over the past six years.

Over the past 10 years, Santoku has undergone some significant organizational changes and has introduced some exciting new technologies to the rare earth industry. These include:

- 1990 — Mass production and sale of hydrogen absorption alloys for NiMH batteries was started.
- 1993 — Collaboration with Rhone Poulenc Chimie (presently Rhodia Electronic & Catalysis) through its affiliate, Anan Kasei, Ltd.
- 1994 — Construction of the Akashi Plant was completed and the plant began operations.
- 1994 – Development of innovative strip casting technology as a new casting method for NdFeB alloys and hydrogen absorption alloys. Patent registered.
- 1996 — Institution of recycling technology of rare earth elements from NdFeB magnet scrap.
- 1999 — In April, established Santoku America, Inc. as 100% subsidiary of Santoku in Illinois, USA. In October, Santoku America, Inc. purchased Rhodia's Rare Earth Metals & Alloys Business, including the production facility in Phoenix, Arizona.
- 1999 — Santoku celebrated its 50th anniversary in business.
- 2000 — Santoku's official name changed from Santoku Metal Industry Co., Ltd. to Santoku Corporation.
- 2000 — Santoku received ISO 9001 certificate of quality from UKAS.

Santoku has been working in cooperation with Rhodia Electronics and Catalysis in the field of rare earth chemical Compounds through its affiliate, ANAN KASEI, Ltd. since 1993. To further reinforce its metals and alloys business, Santoku purchased Rhodia's plant in Phoenix, Arizona. This acquisition has given Santoku an established manufacturing site in North America and has added strength to Santoku's worldwide marketing position.

For the future, Santoku is concentrating its business on rare earth metals and alloys and non-rare earth products, such as zirconium compounds and lithium compounds. Santoku has processed scrap recycling of rare earth magnets for the protection of the environment for more than 20 years. Its scrap recycling technology helps solve its customers' environmental concerns, and scrap recycling is becoming more important for production considering the current rare earth materials supply situation from China. Santoku is the only manufacturer in the world that recycles NdFeB swarf (powder obtained from cutting and polishing process of NdFeB magnets) at its own alloy manufacturing facilities. Santoku receives NdFeB swarf from its customers, chemically separates the rare earth elements from the swarf, reduces the separated rare earth elements to metals, and then recycles these metals into NdFeB alloy products. The scrap materials for NiMH and Li-ion batteries are also recycled at Santoku, although through a different process.

Santoku's ongoing mission is to provide its customers with high quality products and service, while at the same time bringing new and improved products to the market place.

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ICFE'4

Contributed by Prof. R. Sáez Puche

The Fourth International Conference on f-Elements, ICFE-4, was held September 17-21, 2000, at the Conference Hall of the Universidad Complutense of Madrid, Spain. This ICFE-4 is a continuation of the series organized by the European Rare Earths and Actinides Society (ERES), after Leuven (ICFE-1, 1990), Helsinki (ICFE-2 1994), Paris (ICFE-3 1997), and before Geneva, scheduled in 2003. These broad scope conferences are devoted to science and technology of *f*-elements.

The program has covered different topics related to the synthesis and properties of novel compounds with applications in fields such as electronics, optics, lasers, magnetism, catalysis, medicine, etc. The conference was organized in the following twelve symposia, each of them with oral and poster sessions: a) synthesis, structure and defects, b) coordination and organometallic chemistry, c) optical materials, d) magnetic properties and magnetic materials, e) ionic conductivity and solid electrolytes, f) superconductors, h) catalysis, i) electronic properties, j) spectroscopies, k) biomedical applications, l) f-elements in geology and environment, m) session in memory of Prof. Clyde Morrison.

Highlighting the program was the presentation of the first ERES award for young researchers in rare earths and actinides granted to Dr. K. Binnemans (Belgium), as well as the P-E. LeCoq de Boisbaudran award to an outstanding senior scientist, generously sponsored by Rhodia Terres Rares, granted to Dr. P. Caro (France).

ICFE-4 was attended by 350 scientists representing 30 countries; more than half of the participants came from countries outside the European community. The conference featured five plenary lectures by C. Vettier (France), A. Kaminskii (Russia), A. Trovarelli (Italy), X. Obradors (Spain), and J-C. Bunzli (Switzerland), 18 invited lectures, 70 oral presentations and 341 poster contributions.

The proceedings of the ICFE-4 are being published as regular issues of the *Journal of Alloys and Compounds*.

The support received from the industry and official organizations has been essential for the ICFE-4 conference; the Spanish Ministry of Education, Universidad Complutense of Madrid, Universidad Autónoma of Madrid, Consejo Superior Investigaciones Cientificas, European Rare Earths and Actinides Society, and Rhodia Terres Rares were the main sponsors.

The conference was chaired by Prof. R. Sáez Puche together with the Organizing Committee: Drs. A. de Andrés, C. Cascales, J. Garcia Solé, L. C. Otero Diaz, and J. Fernández. Several social events took place during the conference from the welcome reception to the flamenco evening, and the panoramic tour of the Heritage Mankind City of Segovia where the conference dinner was held. ▲

Conference Calendar

Note: Reach as many potential conference attendees as possible! Send us your conference announcement and we will publish it here.

May '01
The Twentieth Annual Conference on Properties and Applications of Magnetic Materials
Chicago, Illinois, USA
May 14-16, 2001
*This issue

The Third International Conference on Hydrogen Treatment of Materials (HTM-2001)
Donetsk, Ukraine
May 14-17, 2001
RIC News **XXXV**, [2] 6 (2000)

June '01
The 4th International Conference on Rare Earth Development & Applications (ICRE-2001)
Beijing, China
June 15-20, 2001
RIC News **XXXV**, [2] 6 (2000)

July '01
International Conference on Dynamical Processes in excited States of Solids (DPC'01)
Lyon, France
July 1-4, 2001
RIC News **XXXV**, [3] 3 (2000)

August '01
Joint European Magnetic Symposia EMMA-MRM (JEMS'01)
Grenoble, France
August 28-September 1, 2001
*This issue

September '01
Rare Earths' - 2001
São Paulo - SP, Brazil
September 22-26, 2001
Website: http://www.iq.usp.br/geral/congress.html.
RIC News **XXXIII**, [4] 3 (1998)

July '02
The 23rd Rare Earth Research Conference
Davis, California, USA
July 13-18, 2002
RIC News **XXXV**, [2] 4 (2000)

August '02
17th Int. Workshop on Rare-Earth Magnets and their Applications
Newark, Delaware, USA
August 19-22, 2002
RIC News **XXXV**, [4] 3 (2000)

July '03
International Conference on Magnetism (ICM'2003)
Rome, Italy
July 27-August 1, 2003
*This issue

"*This issue" denotes a news story for this conference is in this issue

Ceramic Film Growth at Low Temperature

C. R. Aita's article "Tailored Ceramic Film Growth at Low Temperature by reactive Sputter Deposition," appeared in *Critical Reviews in Solid State and Materials Sciences* **23** [3] 205-274 (1998). The materials receiving coverage in this article are zirconium, yttrium, and niobium oxides and aluminum and boron nitrides.

The article begins with an overview of the sputter deposition process. The non-electronic plasma reactions that occur are presented, and the diagnostic techniques of mass spectrometry and optical spectrometry are discussed. Mass spectrometry techniques include residual gas analysis (RGA) and glow discharge mass spectrometry (GDMS). Optical spectroscopy methods include optical absorption spectrometry and optical emission spectrometry.

Plasma chemistry-film structure relationships for niobium, zirconium, and yttrium oxides are covered next, with an overview, description of the experiment, calculations of flux fractions to the substrate, phase maps, and a section on general observations. The next major section is on structures and interfaces in zirconia-alumina and zirconia-yttria nanolaminates. This section includes nanolaminate growth and architecture, discussion of zirconia-alumina nanolaminates, zirconia-yttria nanolaminate crystallography and layer roughness, and the effect of reactivity on the structure of the nanolaminates. The last two major sections of the article are focussed on aluminum nitride and boron nitride.

The article is well supported by 184 references, 39 figures, 17 equations, and 6 tables. The figures and tables are easy to read and understand and seem relevant to the text. Overall, this article is an interesting review of the subject.

C. R. Aita is at the Materials Department and the Laboratory for Surface Studies, University of Wisconsin-Milwaukee, P. O. Box 784, Milwaukee, WI 53201 U.S.A. ▲

Search of the Month

Ric Database Report

keywords Nd *AND keywords* SEPARATION *AND keywords* history

Document Number *Article*

190200000 MUTHMANN;W; WEISS;L; HOFER;H; ————ABOUT THE PREPARATION OF THE METALS OF THE CERIUM GROUP BY MELT-ELECTROLYSIS————JUSTUS LIEBIGS ANN. CHEM. 320, 231-69 (1902) ————1902 CE ND HISTORY SEPARATION PREPARATION ELECTROLYSIS

190400030 MUTHMANN;W; WEISS;L; ————INVESTIGATION INTO THE METALS OF THE CERIUM GROUP————JUSTUS LIEBIGS ANN. CHEM. 331, 1-46 (1904) ———— ——1904 HISTORY SEPARATION PREPARATION MM ND PR SM ER CE LA R

192400110 LEVY;SI; ————The cerium group (continued)—lanthanum, praseodymium, neodymium, and samarium ————pp. 186-206 of The Rare Earths, Edward Arnold & Co., London (1924) ————1924 LA PR ND SM HISTORY GENERAL NITRATE SEPARATION

Thursday, February 15, 2001 Page 1 of 1

The search above satisfies a search for historical references on neodymium separation (Nd AND separation AND history). Many more citations would have been referenced if other elements were searched for or if the word "history" is not used in the search.

The database report, as shown above, which is provided when the search is purchased, includes the keywords used for the search and the bibliographical information of the reference, along with other keywords associated with the reference, for each of the references found. A preliminary search, often sent as an evaluative tool for the requestor, will list titles and keywords of the items that match the request.

The cost to receive the full report for this search is US$50.00. The cost for any search is US$50.00, which includes the reference list for up to 25 matches, and any additional matches are available for US$2.00 each. Supporters may receive as many searches as desired for US$300.00 per year for corporate memberships, or US$100.00 for individual memberships.

As an added benefit, supporters receive the 2-page monthly newsletter, *RIC Insight*, that reports on late-breaking news of rare earths and how these developments may impact the rare earth industry.

If you would like us to conduct a search for you, please send your request to: Angela O'Connor, RIC, 112 Wilhelm Hall, Ames Laboratory, Iowa State University, Ames, IA 50011-3020 USA; Tel: 515-294-5405; Fax: 515-294-3709; ric@ameslab.gov. If you would like to become a supporter of the RIC, send your name, address, telephone, fax, e-mail addresses, and your desired level of support to the above address or to LaVonne Treadway, RIC, 116 Wilhelm Hall, Ames Laboratory, Iowa State University, Ames, IA 50011-3020 USA, Tel: 515-294-2272; Fax: 515-294-3709; crem_ric@ameslab.gov. ▲

Prof. R. N. P. Choudhary

In the December issue of the *RIC News* **XXXV**, [4] 6 (2000) a feature was written on Prof. R. N. P. Choudhary's research group. Regretfully, contact information was left out of the article. Anyone interested in contacting Prof. Choudhary may do so at the Department of Physics and Meteorology, IIT Kharagpur, WB – 721302, India, Phone: +91 3222 55221 4911, e-mail: crnpfl@phy.iitkgp.ernet.in. ▲

JEMS'01

The *Joint European Magnetic Symposia*, a joint meeting of the European Magnetic Materials and Applications (EMMA) and the Magnetic Recording Materials (MRM), will be held in Grenoble, France, August 28-September 1, 2001. This meeting takes the place of the 2002 meeting of the EMMA and the 2001 meeting of the MRM, and will also be supported by the organizers of European conference on Magnetic Sensors and Actuators (EMSA). Aspects of the magnetism of matter, the magnetism of materials, and their applications will be discussed throughout JEMS'01.

The program of the conference is made up of nine plenary lectures, 22 semi-plenary lectures, and 10 symposia. The symposia cover soft materials and their applications, magnetic recording materials, spin electronics, artificially structure materials, magnetic materials and characterization, micromagnetism, sensors and micro-devices, numerical modeling and machines, imaging probes and techniques, and hard and magnetostrictive materials and their applications.

For more information, visit the JEMS'01 website at http://www.polycnrs-gre.fr/JEMS01/. This website contains or will contain all the necessary information for the conference, and also lists the titles and authors of the plenary and semi-plenary lectures and the organizers of the symposia. The internet is their preferred method of contact, but in cases where no internet access is available, the contact information is JEMS'01 Conference Secretary, Laboratoire Louis Neel, BP 166, 38042 Grenoble Cedex 9, France, Phone: +33 (0) 476 88 74 38, Fax: +33 (0) 476 88 79 27, e-mail: JEMS01@polycnrs-gre.fr. ▲

NEWS FROM JAPAN

Our thanks to Kensuke Shimomura for supplying the content and translations for this section.

The Asahi Shinbun, November 23, 2000: Sanyo Electric Co. plans to begin large-scale production of rechargeable batteries beginning in January 2001. The plant, in Nuevo Leon, Mexico, will produce NiMH and Li-ion batteries, with an expected initial annual output of 20 million packs with a workforce of 8700 in 2001, with expectations of growing to 60 million packs a year with a workforce of 2100 by 2003. The batteries produced in Mexico will be sold in North America.

The Nikkan Kogyo Shinbun, December 8, 2000: Matsushita Battery Industrial Co. is planning to double its output of prismatic Li-ion batteries widely used in mobile phones by the end of March 2001. One of the other products the company will focus on are AAAA size NiMH batteries.

The Japan Times, December 16, 2000: Toyota Motor Corp. and Ford Motor Co. are in discussions about forming ties between the two companies. One option for a partnership between the two companies may be the development of hybrid cars.

The Asahi Shinbun, January 5, 2001: Sanyo Electric Co. will be the exclusive supplier of the battery systems for Ford Motor Co.'s Escape HEV, which has an expected launch date of 2003. The 300-volt NiMH battery pack contains 240 cells, and is expected to have consistent output, improved efficiency when recharging at high temperature, improved storage quality, a 50% reduction in battery size, and stabilized battery temperature (within 5 degrees). These qualities are all improvements over batteries and systems currently in use.

The Asahi Shinbun, January 10, 2001: Two hybrid vehicles took second and third place in the Car of the Year awards at the North American International Auto Show in Detroit, Michigan. The Toyota Prius took second place and the Honda Insight came in third. The top Car of the Year award went to DaimlerChrysler's PT Cruiser.

The Japan Times, January 10, 2001: General Motors Corp and Toyota Motor Corp. are joining together to develop a fuel-cell engine using gasoline as the hydrogen-producing source. A prototype fuel-cell car may be completed by the end of the year.

The Japan Times, January 10, 2001: Cell phone shipments worldwide are expected to reach 420 million units for 2000, far outpacing the 280 million shipped in 1999. The growth is due to new subscriptions in the Asia-Pacific and Latin America and a steady demand for updated models in Europe.

The Japan Times, February 10, 2001: Dupont has formed a fuel-cell unit to capture some of the growing clean-energy market. Dupont plans to form partnerships with other companies to improve the capabilities, availability, and economic feasibility of fuel cell technology. ▲

ICM'2003

The International Conference on Magnetism (ICM'2003) will be held in Rome July 27 – August 1, 2003. It is one of a triennial series of conferences held under the auspices of the International Union of Pure and Applied Physics (IUPAP). A number of satellite conferences will be held before and after ICM'2003, three of which will take place in Italy, and one or two more yet to be planned in neighboring European countries.

The purpose of the conference is to provide a forum for the presentation and discussion of new concepts and new developments in all areas of theoretical and applied magnetism, as well as in materials research and applications.

For more information, visit www.icm2003.mlib.cnr.it or send e-mail to icm2003@mlib.cnr.it. As of this writing, much information was missing from the website, but it is expected that details will be added as they are worked out. ▲

2001 Japan Prize

The recipient of the 2001 Japan Prize for Science and Technology of Environment Conscious Materials has been announced. This year's recipient is John Goodenough, a materials scientist at the University of Texas, Austin.

Goodenough is cited for his development of lithium cobalt oxide, which is used in lithium-ion batteries, often used in laptop computers and cell phones. Lithium-ion batteries are lighter and last longer than batteries that use other materials.

The prize was announced on December 14, 2000, and will be awarded at a ceremony to be held in Tokyo in April 2001. ▲

Bernd T. Matthias Prize

The prize committee of Materials and Mechanisms of Superconductivity High Temperature Superconductors VI (M^2S) has awarded the Bernd T. Matthias Prize to M. Brian Maple.

The Bernd T. Matthias Prize is awarded in recognition of innovative contributions to the materials aspects of superconductivity. M. Brian Maple was awarded this prize for his pioneering contribution to the understanding of superconducting materials in general, and interplay between magnetism and superconductivity in particular.

M^2S was held February 20-25, 2000, in Houston, Texas, USA. The Prize was awarded February 21, 2000, and is sponsored by the Texas Center for Superconductivity at the University of Houston. ▲

Consultant's Corner

To appear in our Consultant's Corner, any individual, company, or group must be involved in are earth or rare-earth-related consulting activities. Just send us the appropriate information: contact name, company name, mailing address, Tel/Fax number(s), email, web address and areas of expertise.

Aron Vecht and Associates: Aron Vecht, Principal, 95 Corringham Road, London, NW11 7DL, Telephone: 020 8455 4361; Fax: 020 8201 9555; e-mail: phosphors@vecht.com ▲ Areas of expertise: consultants on phosphors (inorganic or organic), rare earths and semiconductors, thin films and electronic display technology, technology transfer.

The MagLab at Polar Materials Company, Gary Bush, Ph.D., 5505 Castle Manor Dr., San Jose, CA 95129-4169, Telephone: 408 255-8345; Fax: 408 255-1065; www.maglab.com. ▲ Areas of expertise: Technical services — electromagnetics and magnetic materials measurements.

Wheeler Associates Permanent Magnet Consultants: Mr. Port Wheeler, President, 232 West Poplar Street, Elizabethtown, Kentucky 42701, Telephone: 270 769-3919; Fax: 270 765-2137; e-mail: Portwheelerassoc@aol.com. ▲ Areas of expertise: Serves the international permanent magnet industry and market in a consulting capacity. Available by subscription is MAGNETRENDS, which covers a wide range of global permanent magnet topics and events. Mr. Wheeler has 20 years experience in senior management positions in the permanent magnet industry, and throughout his career has been active in promoting permanent magnet material development. Wheeler Associates is affiliated with an international network of independent consultants with specialties in all aspects of the permanent magnet business. ▲

Handbook on the Physics and Chemistry of Rare Earths Volume 26

Volume 26 of the *Handbook on the Physics and Chemistry of the Rare Earths*, edited by K. A. Gschneidner, Jr. and L. Eyring, was published by Elsevier Science B.V. in 1999.

This volume contains four chapters, numbered 169 through 172. Chapter 169 discusses using x-ray diffraction from synchrotron radiation sources, rather than neutron diffraction, for studies of lanthanide magnetism. Major areas discussed include the x-ray scattering cross section, the magnetic structure of holmium, the lanthanide elements, and alloys, compounds, and superlattices. The article, by D. F. McMorrow, D. Gibbs, and J. Bohr, has a favorable outlook for the continuation of the development of these techniques.

The second chapter is devoted to static and dynamic stresses. This chapter, by A. M. Tishin, Yu. I. Spichkin, and J. Bohr, presents findings from the last 20 years on the topic of the relationships between pressure and stresses on a material and the magnetic properties of that material.

The next chapter, by N. H. Duc and T. Goto, addresses metamagnetism of the Co sublattice in lanthanide-cobalt intermetallics. Itinerant electron metamagnetism (IEM) models are presented, along with an experimental overview and future prospects.

The final chapter in volume 26 is on photoelectron spectroscopy in heavy fermion systems, by A. J. Arko, P. S. Riseborough, A. B. Andrews, J. J. Joyce, A. N. Tahvildar-Zadeh, and M. Jarrell. The emphasis of the chapter is on single crystals, and several models are presented along with new developments in this analysis method.

Overall, this volume is an excellent addition to the series. The articles all contain illustrative figures and equations and extensive bibliographies for those with the interest to explore. This 576-page book (ISBN: 0-444-50185-1) is available from Elsevier Science, P. O. Box 211, 1000 AE Amsterdam, The Netherlands, or in the U. S. A. and Canada from Elsevier Science Inc., P. O. Box 945, Madison Square Station, New York, NY 10160-0757, U. S. A. for US$236, NLG 465, euro 211.01. ▲

Pairing Symmetry

A review entitled "Pairing symmetry in cuprate superconductors," *Review of Modern Physics* **72** [4] 969-1016 (2000), by C. C. Tsuei and J. R. Kirtley, presents a compilation of evidence for *d*-wave pairing symmetry in optimally doped cuprate superconductors.

The purpose of this review is not to define the mechanism of superconductivity in cuprate superconductors so much as to lay out the evidence in favor of *d*-wave pairing symmetry and place constraints on possible models. The introduction of the paper presents evidence for Cooper pairing and discusses the order parameter and symmetry issues in superconductors. This is followed by several sections devoted to the evidence for d-wave pairing.

Non-phase-sensitive techniques show that highly anisotropic pairing, with a line of nodes in the superconducting gap, exist in superconducting cuprates. However, because these tests are phase-insensitive and model dependent, they can be controversial. Phase-sensitive pairing symmetry tests have been developed, and these are based on Josephson tunneling and flux quantization. Rather than measuring the magnitude of the Josephson current, the new tests look for sign changes in the Josephson critical current. Four kinds of measurements are described in the article, and the universality of *d*-wave pairing in superconductive cuprates to both positive and negative carriers is discussed. Some related symmetry sensitive experiments are also presented. Discussions of the implications of *d*-wave pairing symmetry for pairing interactions, quasiparticles, surface and interfaces, and the vortex state round out the article.

The authors' arguments are supported by 358 references, 60 equations, 28 figures, 19 footnotes, and four tables, which do help clarify their points. Their conclusions provide a convincing starting point from which to define the superconducting mechanism in cuprate superconductors. The authors also believe this approach could lead to future novel applications for these materials. ▲

The Possible Way to High-Temperature Superconductivity

A recent review by Miodrag L. Kulic, "Interplay of electron-phonon interaction and strong correlations: the possible way to high-temperature superconductivity," *Physics Reports* **338** 1-264 (2000), presents a thorough discussion of the properties of high-temperature superconductors and an argument for the mechanism responsible for the high-temperature superconducting state.

The primary focus of the review is on the electron-phonon (E-P) interactions and the electronic correlations. The review presents evidence that these two together can be responsible for many, if not all, of the observable properties of high-temperature superconductors. Phonon features are present in the conductance, and help lend support, along with infrared and Raman optic measurements, to the E-P interaction as the pairing mechanism in high-temperature superconductors. The E-P interaction is the result of the layered, nearly ionic structure of high-temperature superconductors and the two-dimensional motion of the conduction carriers. In low-temperature superconductors, the phonon mechanism leads to *s*-wave pairing, but in high-temperature superconductors, the electronic correlations renormalize the E-P interactions so that a forward scattering peak appears, while the backward scattering is diminished. This results in several changes in the materials that allow superconductivity.

This review is an extensive work and is bolstered by 446 other references. The discussions are in-depth; no detail is left uninvestigated. There are nine major sections of the paper, including the introduction and conclusions. Major topics include the following: 1. Properties of high-temperature superconductors, including crystal structure and phase diagram, magnetic properties, conductivity/resistivity, Raman scattering, renormalization of phonons, tunneling spectroscopy, and isotope effect. 2. E-P interactions in high-temperature superconducting oxides, including coupling theory, LDA calculations, and non-adiabatic effects. 3. The theory of strong electronic correlations. 4. E-P interaction and strong correlations. 5. Spin fluctuations and E-P interactions. 6. E-P interaction beyond the Migdal approximation. 7. Nonmagnetic impurities and their influence on *d*-wave pairing.

The work is also supported by four appendices that further describe and explain tunneling in superconductors, the X-method and slave-boson approach, the X-method and the E-P interaction, and the X-method and the E-P interaction – two-band model. Kulic's points are illustrated by 103 figures and clarified by a total of 433 equations. His review is successful in presenting a convincing argument that electron-phonon interaction along with strong correlations offer more complete and plausible explanations of the properties of both the superconducting and normal states of superconductors than do spin fluctuation arguments.

For more information, Miodrag Kulic can be reached at Physikalisches Institut Universitat Bayreuth, 95440 Bayreuth, Germany, e-mail: btp509@uni-bayreuth.de. ▲

E-Mail Subscription

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To receive the *RIC News* via e-mail, please specify which format you would prefer and send your e-mail address to: RIC, 112 Wilhelm Hall, Iowa State University, Ames, IA 50011-3020 USA; RIC@ameslab.gov. ▲

Newsletter on the Web

The *RIC News* is available on the Web at http://www.external.ameslab.gov/ric . ▲

Studies of High Temperature Superconductors

The RIC has recently received five new volumes (29, 31, 32, 33, and 34) of the Studies of High Temperature Superconductors series, edited by Anant Narlikar and published by Nova Science Publishers, Inc.

Volume 29 was published in 1999, and contains six papers covering a variety of "broad frontal issues of superconductivity." These include the mechanism of high T_c superconductivity, extra high T_c superconductivity, the normal state pseudogap, and the isotope effect several different superconducting systems. Also included are two papers on measurement techniques, one each on positron annihilation and electron spin resonance, and their importance in the study of the above issues in superconducting materials.

Volumes 31 – 34 were published in 2000. The main focus of Volume 31 is flux pinning in high temperature superconductors. Specific topics that are related to rare earth materials include flux depinning near the glass-liquid transition, microstructure and flux pinning in rare earth-copper oxides, magnetization discontinuities in $YBa_2Cu_3O_{7-8}$ at melting and freezing, vortex depinning effects, and flux creep-flux flow crossover in the presence of disorder. There are also papers on equilibrium properties and pinning in mixed phase superconductors and the effect of radiation and chemical substitution on flux pinning in Hg-based materials.

Volume 32 continues on the topic of flux pinning, with a focus on associated AC losses. AC losses in tapes, wires, and bulk materials, AC susceptibility, critical current densities, residual losses, and transport properties are discussed through out the seven chapters of this volume. The materials most often addressed are BSCCO superconductors, but YBCO-type materials are mentioned in several chapters. The last paper in the book is devoted to flux pinning in 123-type high T_c superconductors, so rare-earth materials receive greater coverage there.

Volume 33 wraps up flux pinning and AC losses and starts discussions on stripe phases. Of the seven chapters in this volume, the first three discuss AC losses: transport losses in multifilamentary tapes, numerical calculation of losses in wires, and loss in superconducting power cables. While interesting, these three do not really deal with the rare earths. The fourth chapter is about vortex localization by columnar defects, and does have a section on YBCO. The last three are devoted to stripe phases. One addresses solely the superconductivity and structure of $(La,M)_2CuO_4$ materials, and the other two are more theoretical articles on the t-J model and its application to stripe domains.

Stripe domains are continued in Volume 34, which also addresses organic superconductors and has one article on borocarbide type superconductors. The three chapters on stripe domains cover the growth and properties of La-214 thin films, disorder in stripe domain materials, and the vortex-core pseudogap and stripe phases. The borocarbide article covers single-crystal growth of YNi_2B_2C-type superconductors.

Overall, these volumes give an overview to the current status of the research being performed on superconductor materials. The work presented is produced by a variety of researchers from around the world; each volume has global representation. The papers are generally well produced, and figures and equations are included to elucidate the reader. Each individual chapter has an extensive bibliography for the interested reader to gain a broader understanding of the work previously done in the field. ▲

Rhodia Name Change

Effective January 1, 2001, Rhodia Rare Earths has changed its name to Rhodia Electronics and Catalysis. Three business units will be the basis for the structure of the enterprise: Catalysis, Electronics, and New Materials. ▲

Properties and Applications of Magnetic Materials

The Twentieth Annual Conference on Properties and Applications of Magnetic Materials will be held May 14-16, 2001, at the Illinois Institute of Technology in Chicago, Illinois, USA. The conference is co-sponsored by the IEEE Magnetics Society.

Five sessions will comprise the conference. The sessions on New Materials and Designs for Energy Efficiency, Annealing Fundamentals and a Review of Magnetic Testing Procedures, and Magnetic Sensors and Actuators would likely prove most interesting to those involved with rare earths. The remaining two sessions focus on steel magnetic materials, one session devoted to transformers and related devices and the to motors and generators. General areas of focus include quality control in manufacturing, materials properties and processing, design and construction of magnetic devices, and innovative materials for technological application.

For more information on registration, lodging, and planned activities, contact Bonnie Dow, Conference Secretary, Illinois Institute of Technology, Phone: (312) 567-6809, Fax: (312) 567-8976, e-mail: bonnie@ece.iit.edu. ▲

Rudolph E Erren Award

Prof. Victor A. Goltsov, Donetsk State Technical University, Ukraine, has been presented with the International Association for Hydrogen Energy (IAHE) Rudolph E. Erren Award for Outstanding Contributions to Hydrogen Energy in General and to Hydrogen Treatment of Materials in Particular.

Rare-earth intermetallic compounds are very sensitive to hydrogen treatment, and their structure and properties can be greatly improved by this treatment. More information on hydrogen treatment of materials and some references to papers on this subject can be found at http://www.dgtu.donetsk.ua/hydrogen/. ▲

In Memoriam

Hendrik Brugt Gerhard Casimir died on May 4, 2000, in Heeze, the Netherlands. He was a brilliant scientist and a leader of industrial research.

His research interests included quantum mechanics, and he proposed the hypothesis of an electrical quadrupole in the nucleus of europium that accounts for europium's hyperfine structure.

Throughout his career he had close interactions with some of the historically best known scientists, including Niels Bohr, Paul Ehrenfest, and Wolfgang Pauli. During World War II, Casimir started working at the Philips Research Laboratories in Eindhoven, the Netherlands. He was placed in charge of all Philips' research activities worldwide, and under his guidance researchers were allowed much freedom directing their own work, as long as their experiments could potentially benefit Philips and were not repetitive or unchallenging.

Casimir also helped develop the idea of the science-technology spiral, which describes how science and technology help each other advance. He was the recipient of many science awards and honors. His interests also extended beyond science to the arts and literature. ▲

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Since the December issue of the *RIC News*, we have received renewed support from 27 organizations and individuals. We always welcome new supporters into the RIC family. If you would like to help support us and the rare earth community by becoming a sponsor, call (515) 294-2272, send a fax to (515) 294-3709, or send an e-mail to crem_ric@ameslab.gov stating your desired level of support.

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