RARE-EARTH INFORMATION CENTER NEWS

ENERGY AND MINERAL RESOURCES RESEARCH INSTITUTE
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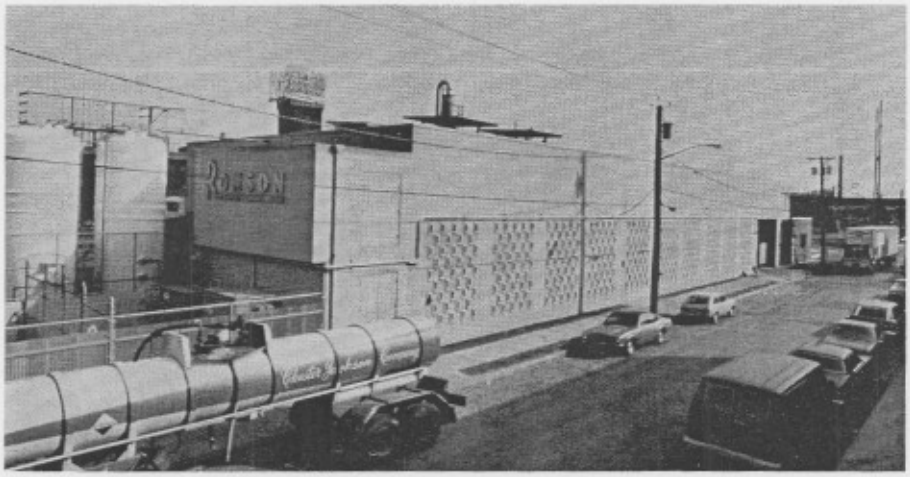
Who is. . .'The Rare Earth Industry'?



New Plant Expansion at Ronson Metals

Ronson Metals Corporation

Ronson Metals Corporation of Newark, New Jersey, doubled its capacity for production of mischmetal during 1977. Throughout the year, demand by the steel industry for mischmetal (mixed rare earth metals) was exceptionally strong, as a result of which sales increased by substantially more than 100% over 1976. 1978 has seen continued growth in demand for mischmetal and sales of Ronson Metals Corporation for the whole year will set new records.

The versatility of mischmetal treatments in the production of nodular iron is demonstrated by its use in pressurized vessels, in open ladles, in plunging devices, in the Fischer Process, as well as in other ways. Mischmetal also makes a contribution towards minimizing in-plant pollution problems because of its non-smoking characteristic. Many foundries are raising the level of their mischmetal additions in order to enhance the recovery of magnesium, increase nodular count and decrease smoke levels.

Ronson Metals Corporation has been active in the application of the rare earth metals in alloys with cobalt for production of powerful permanent magnets. The role of mischmetal in this field is likely to increase at an accelerated rate as demand for these new magnets grows.

In addition to being one of the world's oldest and largest producers of mischmetal, Ronson Metals is one of the leading producers of cigarette lighters and welding igniter flints and other specialty pyrophoric and sparking metal products based on mischmetal-rich iron alloys.

Ronson Metals holds a variety of patents associated with the preparation and production of cerium and mischmetal alloys, thorium vacuum tube getters, metallurgical additives, sparking metal processes and products, extruded rare earth alloy products and abrasive evaluation equipment. A direct result of

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Financial Support. . .

. . .for the Center has matched last year's record-setting pace as ten companies renewed their support of RIC during the second quarter to bring the total number of companies to thirty. Contributors are listed below (the number in parentheses is the number of years the company has supported RIC).

Cerac, Inc., U.S.A. (3)
Eastman Kodak Company, U.S.A. (2)
Foote Mineral Company, U.S.A. (7)
Metalurgica Corona Ltda., Brazil (3)
Mischmetal and Flints Private Limited, India (3)
Molycorp, Inc., U.S.A. (11)
Rare Earth Products Limited, Great Britain (7)
Reactive Metals & Alloys Corporation, U.S.A. (3)
Santoku Metal Industry Co., Ltd., Japan (9)
Shin-Etsu Chemical Co., Ltd., Japan (9)

CEF Conference

Tentative plans have been made for an International Conference on Crystalline Electric Field and Structural Effects in *f*-Electron Systems to be held November 1979 in Philadelphia, PA, U.S.A. The precise time and location for the Conference will be announced later. The program is expected to include the following topics: crystal field excitations and lifetimes; exchange and quadrupolar interactions; cooperative phenomena, structural and magnetic transitions, surface magnetism; magnetoelastic and anisotropic effects; and influence of crystal field split ions on other properties. For more information and/or to suggest other topics write to:

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EUROPE—1978

Garching-Grenoble-Zurich

Late last summer Grenoble, France and environs were for a few weeks the glittering Camelot of the condensed phase scientific world by hosting three major conferences: the 15th Low-Temperature Conference (LT-15), the Conference on the Electronic Structure of the Actinides, and the Colloquium on the Physics of Metallic Rare Earths. Although the editor only attended the last conference, many scientists attended two of the three and a few attended all of them.

The International Colloquium was held in a small village resort and ski town of St. Pierre de Chartreuse which is located in the French Alps about an hour's drive from Grenoble. The rainy weather kept the attendance in the oral and poster presentations probably higher than one might expect considering the beautiful and scenic surroundings. The French were excellent hosts and kept everyone well (perhaps too well) fed—the quantity was abundant and the quality was superb.

There were over 220 participants at the Conference from 22 countries, which included scientists from almost all of the Western European countries (12), Australia, Brazil, Bulgaria, Canada, Israel, Japan, Peoples Republic of China, Poland, U.S.A., and U.S.S.R. The Conference was divided into nine oral presentation sessions (two each day except Wednesday when there were three) and four poster sessions which were available to the participants all day. Each oral session began with two or three invited papers, (except the session on "Technical Applications" which consisted entirely of five invited talks) and these were followed by contributed papers. There were a total of 22 invited talks, 40 contributed oral papers, ~ 77 poster papers and one round table discussion session on valence instabilities. Papers on valence instabilities and magnetic properties dominated the Conference, but there were a number of papers on electronic structure, transport and thermal properties, amorphous and liquid materials, NMR, Mössbauer and ESR, crystal field effects, and applications. The proceedings will be published in the *J. Physique (Paris).*

Most of the invited papers were well done and informative but a few were so overcrowded with detail that it was difficult for the non-expert to get much out of the talk. There were a number of excellent contributed oral and poster papers, which were of special interest to me. It was scientifically and technically an exciting, informative and profitable Conference. It was good to meet and visit with and to discuss items of mutual interests with my old friends, and to make new friends with those scientists with whom I had not yet personally met prior to this Conference.

Before the Conference, I was able to visit one laboratory and then a second one before returning to the U.S.A. The first stop on my itinerary was the Laboratorium für Festkörperphysik, Eidgenössische Technische Hochschule (ETH) in Zürich, Switzerland. Most of the time was spent with Prof. P. Wachter and his group, especially Dr. E. Kaldis, in discussions concerning rare earth semiconductors and semimetallic compounds, such as TmSe, EuSe, GdP, etc. Several of these compounds are mixed valence compounds, i.e. the rare earth element has an overall valence intermediate between 3 and 2. Most of their current activities are concerned with TmSe base alloys. At room temperature TmSe exists from a Tm:Se ratio of 0.87, where Tm's valence is 3.0, to a ratio of 1.05 where Tm's valence is 2.71. At the 1:1 stoichiometry the Tm has a valence of 2.75. The lattice parameter change across this solid solution range varies by 1.7%. This change is one to two orders of magnitude larger than is found in solid solution ranges for materials which have a constant valence. When Te is substituted for Se the valence of Tm decreases. At a concentration between x = 0.2 and 0.5 in the $TmSe_{1-x}Te_x$ system large changes in the lattice parameters (~0.1 Å) could be induced by a small application of pressure, i.e. the grinding of a sample in a mortar to prepare a powder sample for X-ray measurements was sufficient to do this.

Dr. G. Busch, who was head of the Laboratorium für Festkörperphysik at the ETH for many years, retired at the end of September. His research group is being divided into two groups, one of which is being headed by Prof. Wachter, who will continue the work on rare earth semiconductors.

The last stop in my European trip was a visit to the Zentralinstitut für Tieftemperaturforschung (ZITTF) in Garching just outside of Munich, Germany. There I discussed our on going joint research projects with Dr. C. Probst, with whom we are collaborating (along with Dr. J. Wittig at Kernforschungsanlage Jülich) on the superconductivity of Sc at high pressures (T_c = 0.35 K at 210 kbar), and with Dr. K. Neumaier, with whom we are collaborating on the low temperature (<1 K) heat capacity of Lu-H solid solution alloys. One of the groups at ZITTF is using $PrNi_5$ to reach milli Kelvin temperatures (0.001 K) by adiabatic magnetization cooling. $PrNi_5$ is a promising refrigerant for attaining low temperatures and is being used in at least a dozen laboratories throughout the world.

Nutritional Markers

A study of the feasibility of using a mixture of lanthanide oxides as a nutritional marker in humans has uncovered evidence of either single or two physiologic compartments in the human alimentary tract according to T. D. Luckey, B. Venugopal, D. Gray and D. Hutcheson [*Nutrition Reports International* **16**[3], 339-47 (1977)]. Using a mixture of Tb_4O_7, Sc_2O_3, La_2O_3, Eu_2O_3, Sm_2O_3, Dy_2O_3, Yb_2O_3 and Tm_2O_3 as a nutritional marker the researchers hoped to determine the transit time, rate of passage and recovery in humans eating their usual food. Two of the four subjects retained the markers almost twice as long as the other two which could suggest a single compartment versus a two compartment alimentary tract. Other possible causes include individual idiosyncrasies and diet composition. The difference could not be correlated to age, sex, height, weight, exercise or eating habits. These results clearly establish the feasibility of lanthanide oxide mixtures as nutritional markers in humans and point to further experiments that will help determine what affects the rate of passage in humans.

ANALYTICAL AWARD


V. A. Fassel

Dr. V. A. Fassel, deputy director of Ames Laboratory and professor of chemistry at Iowa State University, is the recipient of the American Chemical Society's Award in Analytical Chemistry. The award cites his research on trace analysis of rare earths in complex materials and development of flame emission and X-ray excited optical fluorescence techniques and spectrometric determination of gases in metals. This research has earned Fassel numerous awards over the years, including a Distinguished Professorship at Iowa State University. Fassel is active in several national and international scientific societies.

RE's in the News

Better Laser

International Laser Systems, Inc., Orlando, Florida, has developed a pulsed Nd:YAG-pumped dye laser which delivers ten times the power output of currently available commercial laser systems. The laser has a 500- to 900-nm wavelength range. Possible applications include underwater illumination and medical research.

Shiva at Full Power

Lawrence Livermore Laboratory's Shiva laser system focused 26 trillion watts of optical power in 95 picoseconds on a deuterium pellet in its first full power fusion experiment. A record 7.5 billion fusion reactions were recorded.

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Anomalous Absence

Due to the fact that the iron atoms in the compounds $CeFe_2Si_2$ and CeFeSi have identical environments made up of four silicon atoms in the form of a tetrahedron, E. M. Levin, R. V. Lutsiv, G. V. Popov and S. I. Yushchuk have undertaken a comparative study of the state of the electron shells of the iron atoms in these compounds [*Pis'ma Zh. Eksp. Teor. Fiz.* **26,** 740-2 (1977); Eng. Trans.—*JETP Letters* **26,** 576-8 (1977)]. Using nuclear gamma resonance spectroscopy they observed a narrow absorption line at near zero velocity, negative isomeric shifts relative to Fe^{57} and no Zeeman splitting. Since both compounds order magnetically these results indicate that there is a magnetic moment associated with the iron electrons but no effective magnetic field at the iron atom nuclei. The authors suggest that mutual cancellation of the contributions of the *s* electrons is caused by the covalent character of the bond between the iron and silicon atoms.

Magnetic Semiconductor Conference

An international meeting on magnetic semiconductors has been scheduled for September 10-13, 1979 in Montpellier, France as a satellite conference of the 1979 International Conference on Magnetism (September 3-7, 1979 at Munich, West Germany). The conference will attempt to summarize the recent developments in the study of insulating and metallic materials. Topics will include optics and photoemission; critical phenomena and phase transition; local environment, stoichiometry and defects; transport; magnetic excitation; and band structure calculation and theory.

The number of participants will be limited to 120 and the registration fee is 250 F.F. (~$60) which includes the cost of the conference proceedings. The proceedings will appear in a special issue of the *Journal de Physique, (Paris).* The official languages will be English and French. Abstracts are due May 1, 1979 and accepted papers will be due July 15, 1979. For additional information contact:

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Place E. Bataillon
34060 Montpellier, Cedex, France

Distinguished Professor


H. J. Svec

Dr. H. J. Svec has been named Distinguished Professor of Chemistry by Iowa State University. This appointment recognizes exceptional teaching and research activities. Svec, currently the program director for chemical physics at Ames Laboratory, served as a chemist on the Manhattan Project at Iowa State University during World War II. He is best known for his work with mass spectroscopy for both research and analysis of many different materials, including the rare earths.

Permanent Magnet Report

Wheeler Associates, Inc. are in the process of preparing a confidential, multi-client, in-depth, international overview of rare earth cobalt permanent magnets. The report will include world markets—present and future; history of development and current R & D programs; case histories of production applications; review of manufacturing processes; assessment of world-wide producers; status of raw material supply and prices; technical progress in materials, devices and systems; and an executive summary which contains observations on the potential growth and relationships of all permanent magnet materials.

For more information call or write:
Mr. Port Wheeler
Wheeler Associates, Inc.
120 North Mulberry Street
Elizabethtown, KY 42701
Telephone (502) 765-6773

RE BULLETIN

The *Rare Earth Bulletin*, an interdisciplinary abstracts journal published by Multi-Science Publishing Co., Ltd., has recently named K. A. McEwen, University of Salford, U.K., as its new editor. The bulletin is issued bimonthly with annual subject and author indices. Subscriptions are available from Multi-Science, The Old Mill, Dorset Place, London E15 1DJ, England at $106.00 per year.

Articles are abstracted from journals dealing with chemistry, physics, electronics, ceramics,

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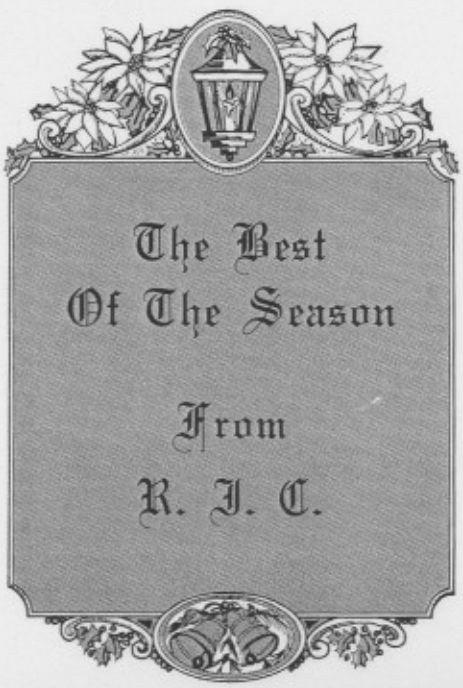
the study that still needs to be done, Ø. Fischer has published a state-of-the-art review concerned with Chevrel phase research [*Appl. Phys.* **16,** 1-28 (1978)]. The many unusual properties of the ternary molybdenum chalcogenides are reviewed with special emphasis on the superconducting properties including critical temperature, critical field and coexistence of superconductivity and magnetism. In addition to the above mentioned properties, the chemistry, structure, preparation, electronic properties, lattice properties and possible applications are discussed. The lattice parameters and superconducting critical temperatures of many (including rare earth) Chevrel phases are given in tabular form.

RE Bulletin
(continued from page 3)

magnetics, crystallography, optics, earth sciences, solid state, metallurgy, and materials science. The abstracts are organized into eight major categories: Distribution and Extraction, Chemical Properties, Phase Equilibria, Crystallography, Nuclear Properties, Solid State, Mechanical and Acoustic Properties and Applications.



electronic and high vacuum devices, and in extended life nuclear energy powered cardiac pacemakers. Ronson Metals was the first in the industry to produce high purity rare earth metals and alloys in the form of finely divided powders.

Ronson Metals takes pride in its production skills and has often pioneered in the development and use of specialized equipment needed in working with rare earth metals. It was the first in the rare earth metal field to use X-ray emission spectroscopy for routine quality control of its products. The most modern and efficient production equipment is used to insure uniformly high quality output.

Ronson Metals, which was established in 1915 primarily as a producer of lighter flints, continues to remain expansion-minded after almost sixty-five years of unbroken rare earth metal activity, finding itself involved, in addition to its original business, in the metallurgical, electronic and chemical industries.

Catalogues of rare earth products and other product lines are available from Ronson Metals Corporation, 55 Manufacturers Place, Newark, NJ 07105. Telephone (201) 589-1380.

EDITOR'S NOTE:

This is one of a continuing series of features on rare earth industry. The information contained herein was supplied by the company featured and its publication should not be construed to constitute an endorsement by RIC or Iowa State University of the products or services offered by the company.

428 pp, $9.50), a critically evaluated compilation of atomic energy levels for 66 atoms and atomic ions of the fifteen elements, lanthanum through lutetium inclusive. This 9½″ x 12″ volume is available from the U. S. Government Printing Office, Washington, D.C. 20402 and is part of a continuing program at the National Bureau of Standards to evaluate and compile the atomic energy levels, spectral wavelengths and classifications of all the elements and fills a noticeable void in the libraries of rare earth researchers who have had occasion to work with energy levels. Only experimentally determined energy levels are included and energies are restricted to outer shell electron excitations and inner shell excitations up to the soft X-ray range. Data given for each atom or ion include the level value, parity, *J*-value, configuration and term assignments, experimental *g*-value, leading percentages and ionization potentials. Preceding the table of data for each atom or ion is a summary which includes basic data, comments and references. The following information is also presented in tabular form: the allowed terms for *L-S* coupling of equivalent electrons, the allowed *J*-values for ℓ^N_j equivalent electrons (*j-j* coupling), corrected Lande *g*-values for terms of both even and odd multiplicity, and the Lande *g*-values for terms of both even and odd multiplicity in order of increasing value.

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