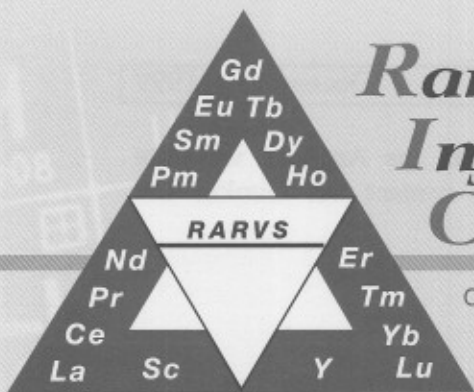


Rare-earth Information Center

Insight



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Russian Rare Earth Resources

An English translation of an article by V. N. Lebedev et al. {*Russ. J. Non-Ferrous Met.*, 38, [8], 40-7 (1997)} presents an evaluation of the rare earth resources in Russia. The article touches briefly on the effect of the demise of the Soviet Union on the production of rare earths in Russia and then evaluates the available resources. The remaining rare-earth production in Russia is the production of loparite concentrate, and its primary processing at the Solikamskii magnesium plant. There are small production sites in Moscow and Verkhnyaya Pyshma, where rare earth metal compounds are separated and refined. Apatite concentrates are produced as a by-product of fertilizer processing from ore deposits in Tomtorskoye. The authors note that the production of concentrate at fertilizer plants in Russia is sufficient to meet all demands in Russia and produce material for export.

Rare earths in the Production of Synthetic Diamonds

In a second English translation, N. A. Kolchemanov {*Russ. J. Non-Ferrous Met.*, 38, [8], 36-9 (1997)} reports on the addition of rare earths to the process for making synthetic diamonds for tool faces. The diamonds are produced, using C-Ni-Mn, which is a "low temperature synthesis", but which results in a high impurity concentration causing significant reduction in strength of the diamonds. Fifty percent graphite and 50% of a 1:1 mixture of nickel and manganese were used as the starting charge. Additions of Nd, Y, Gd, YB₆, GdB₆, LaC₂ and NdC₂ were investigated. It should not be surprising that the RE's are not incorporated into the diamond lattice, but rather serves both to improve wetting of the crystals by the metallic melt and to limit impurities, particularly N. While additions of elemental Nd, Y and Gd improve strength from 2-15%, additions of 3 to 5% YB₆ or GdB₆ resulted in almost a factor of 2 increase in strength. The author attributes this to the formation of BN that greatly reduces the paramagnetic N in the crystals.

Calculation of f-ions Electronic Structure

The interesting optical and magnetic properties of the rare-earth elements arise from the fact that the 4-f electronic orbitals are relatively well localized, and are, to first order, insensitive to their environment. On the other hand, if we wish to know the details of the electronic structure in order to calculate such things as the intensities of optical transitions, the calculations are rather complex. G. Liu and V. Zhorin, Chemistry Division, Argonne National Laboratory, have developed a computer program with a visual interface for the calculation of f-ions electronic structure based on complete free-ion and crystal field Hamiltonian. Either *ab-initio* calculations or the fitting experimental spectra can be used to obtain the Hamiltonian parameters. The calculated wavefunctions can be used for the analysis of ESR spectra, the calculation of optical transitions intensities, and studies of magnetic

ordering and related phenomena. The program can be downloaded from the Argonne web site (<http://chemistry.anl.gov/spectra/>) at no cost. For further information, contact Dr. Guokui Liu (gliu@anlchm.chm.anl.gov), Tel: (630) 252-4630.

R&D 100 Awards

R&D Magazine [September 1999] has announced the annual R&D 100 Awards for new innovative products. Rare earths play significant roles in two of the inventions. Los Alamos National Laboratory received an award for a sulfur-resistant oxygen sensor. Traditional YSZ sensors use an electrochemical cell with Pt electrodes, which are corroded by S at high temperature. The LANL cell uses a Tb-YSZ cell.

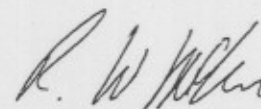
The Pacific Northwest National Laboratory, working with Canberra Industries, received an award for glass fibers that detect radionuclides. The glass fibers contain ^6Li and Ce ions. ^6Li has a high neutron cross-section and a low mass, so that when it absorbs a neutron the recoil leaves an ionization path. The electrons, which are excited by this process, combine with the Ce ions. This releases characteristic photons that are collected in the optical fiber and measured. A neutron flux from a single neutron/sec to 10^6 neutrons/sec can be measured with the fiber.

Company Notes:

The Magnequench Technology Center in Research Triangle Park, North Carolina will open in the first quarter of 2000. The center will offer facilities for Magnequench customers to work with Magnequench staff on prototype design and production. Magnequench International has also announced that in the second quarter of 2000, Magnequench Tianjin Co., Ltd., a new plant for the production of Nd-Fe-B permanent magnet powder, will open in Tianjin, China. Contact: www.magnequench.com.

Morgan Crucible Company plc, a British company based in Windsor, has announced the acquisition of VACUUMSCHMELZE (VAC) from Siemens AG. VAC, which was part of the Passive Components and Tubes Division (PR) of Siemens, has plants in Hanau (Germany), Oklahoma City, OK (U.S.A.), Horná Streda (Slovakia) and Pontian (Malaysia). Of interest to the rare earth community, VAC produces a number of specialty magnetic materials and further processed products, including crystalline and rapidly solidified amorphous and nano-crystalline soft magnetic alloys, as well as NdFeB, SmCo₅, and Sm₂Co₁₇ based magnets. Morgan Crucible has manufacturing locations in more than 40 countries and has recently acquired Crumax, another magnet manufacturer from YBM (*RIC Insight*, [10], October 1, 1999). Contact: <http://www.vacuumschmelze.de/index1.htm>

Tianjiao International Trading Co. (USA) Inc., a wholly owned subsidiary of Baotou Iron & Steel Company, has announced the establishment of warehouses on the east and west coasts of the United States. The warehouses will stock a wide variety of rare earth materials. Contact: Weiji Cui, tel: 650/259-9618, fax: 650/259-9608, baotourea@aol.com.



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