RARE-EARTH INFORMATION CENTER INSIGHT

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

Volume 1 October 1, 1988 No. 8

HIGHLIGHTS FROM THE 18TH RARE EARTH RESEARCH CONFERENCE

September 12-16, 1988, Lake Geneva, Wisconsin

USA Still Largest Producer of Rare Earths

In discussions with J. B. Hedrick from the U. S. Bureau of Mines, it was learned that the U. S. production of rare earths increased from 14,500 mt in 1986 to 17,000 mt in 1987. This is larger than 15,100 mt produced in the People's Republic of China, and thus PRC's claim to becoming the largest rare earth producer was premature - see **RIC Insight** 1 [3] (May 1, 1988).

Egyptian Rare Earths

In a poster, J. B. Hedrick and L. Waked report that heavy mineral sands in the Nile river delta contain ~ 2% monazite and may be an important source of rare earths in the future. Based on a small sampling they concluded that 663,000 mt of monazite (~400,000 mt REO) are contained in a volume of Mediterranean coastline 1 m deep, 1 km wide (inland from the sea) and 250 km long. The authors estimated that there may be as much as 10.2 million mt monazite (6.1 million mt REO) in this 250 km^2 area, if the rare earth content holds to a depth of ~15 m.

Since the Nile delta region covers an area of 22,000 km^2 this could be the world's largest deposit of rare earths, exceeding that at Baiyunebo, Inner Mongolia, People's Republic of China by a factor of ten. A simple calculation indicates that 900 million mt of monazite (530 million mt REO) are present in the Nile river delta region sands, assuming the original rare earth content is the same for the entire delta region to a depth of 15 m.

Clearly, further exploration and evaluation of the Nile delta is needed to see if this potential will be realized.

1:2:3 High Temperature Superconductor Powders

In the last session of the Conference, Art Sleight presented an overview of DuPont's work on high temperature superconductors. In a response to a question by the editor he said that they had developed a new method for preparing the $YBa_2Cu_3O_x$ materials, which are the best precursor powders

-over-

Telephone: (515) 294-2272 Telex: 269266
Facsimile: (515) 294-3226 BITNET: RIC@ALISUVAX

(500 Å diameter) they have ever made for fabrication into useful forms, such as wires, tapes, and thick films.

The 1:2:3 compound was prepared by reacting the components at ~600°C and low O_2 pressures. After the 1:2:3 had formed, the powders were heated at ~450°C in O_2. No carbon was found in these materials, which is good since carbon in the grain boundaries limits the current density in this superconductor.

He said if they get corporate permission more details would be presented at the American Chemical Society Meeting in Los Angeles, September 26-30, 1988.

Mid-infrared Laser Diode

In a session on applied physics and chemistry Dale Partin reviewed his work at the General Motors Research Laboratories and that of others on lead chalcogenides doped with various rare earths. Although most of the rare earth elements can be substituted into PbX (X = S, Se, Te), the most interesting ones are the divalent Eu and Yb. Both lanthanides increase the energy gap of PbTe which is important in making heterojunctions between PbTe and higher band gap materials. For example, when electrons and holes are injected into the PbTe portion of a laser diode they are unable to escape into the higher energy gap materials of the adjacent layers, but efficiently recombine to emit an infrared laser beam in the 3 to 30 μ wave length region.

These new PbEuSeTe/PbTe lasers, also called quantum well devices, operate at temperatures up to 175 K in the CW (continuous wave) mode. This is more than double the 80 K upper limit of the non-rare earth devices. The Eu containing device can also operate up to 270 K in a pulsed mode. The PbEuSeTe/PbTe devices, which are grown by molecular beam epitaxy techniques to form lattice-matched heterojunctions, can be tuned by changing the heat sink temperature at which they operate. These properties have opened up a variety of new potential applications which include: ultrahigh resolution molecular spectroscopy, trace gas detection and pollution monitoring, metabolic studies, surface gas adsorbates, isotope-selective gas detection, and fiber optic communications.

In the fiber optic field the PbEuSeTe/Te laser diode devices are used as optical repeaters and will be a critical component if the heavy metal fluoride optical fibers replace the currently used silica fibers (see **RIC Insight 1** [3] (May 1, 1988).

Next month we will continue our discussion of these quantum well devices and their use in the medical field.

Karl A. Gschneidner, Jr.

K. A. Gschneidner, Jr.
Editor and Director RIC