



# Rare-earth Information Center **INSIGHT**

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## **RIC Survives Desert Storm**

While in the process of writing this issue of **RIC Insight**, I received a most welcome phone call from Joel Calhoun telling me he made it back home to Iowa. As Joel would say -- "fantastic". About the time you read this story he should be back to work. He will be taking some well deserved vacation during May and early June, so if you call us you may still be talking to Jennings "Cap" Capellen, John Mason, or Wayne Calderwood, who have so ably filled-in during Joel's absence. I deeply appreciate their stellar efforts in keeping RIC going for the last three and a half months. We appreciate everyone's patience and understanding.

## **Molycorp up for Sale**

In early April, Unocal Corporation announced that it intends to sell Molycorp, Inc., and its chemical distribution and polymer operations in Schaumburg, Illinois. Unocal has retained Morgan Stanley to seek buyers for its Molycorp subsidiary and these businesses. Morgan Stanley plans to begin the selling process late this month, beginning with Molycorp, Inc., and it hopes to complete the sales by the end of 1991. Unocal chairman, president and CEO, Mr. Richard J. Stegemeier, said that the sales of these Unocal operations are part of their strategy to generate a greater cash flow by focusing on areas where the company has a strong competitive position. Molycorp had a pretax earnings of about \$2.5 million in 1990. The Molycorp subsidiary and the two chemical units produced more than half (\$760 million) of the Unocal's \$1.3 billion in revenue from their chemicals and metals operations.

## **Magneto-Optic Disk Producer**

Materials Research Corporation (MRC) has announced that it will make a major commitment to develop magneto-optic disks. MRC will be working closely with Sony Magnetic Products in this effort. The Magneto-Optics Technology Group of MRC is to develop manufacturing technology for these disks. This will include development of a prototype sputtering system, design and construction of a production-level sputtering system, development and fabrication of materials and targets, and procedures for testing the films and disks. The sputtering system is claimed to be unique in the industry, in that it uses double sided pallets containing eight disks per side for a total of sixteen. The pallets are passed through the modular system and

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materials are sputtered sequentially in different chambers. No dates were given when this system is expected to become operational.

#### Ganjian Rare Earth Ltd. Becomes Operational

Ganjian Rare Earth Ltd., which is a joint venture with Canada Rare Earth Metal Co., began to produce rare earths late last year after two years of construction. The \$3.3 million plant, which is located in Ganzhou, Jiangxi province, will process 200 mt of mixed rare earths a year.

#### Yue Long to Expand Product Line

Yue Long Chemical Plant, Shanghai, recently announced that they will build a plant to produce 100 mt of color TV phosphor and host materials. They are importing technology and equipment from Toshiba (Japan). The new production facility is expected to become operational by the end of 1991. The output of the Yue Long plant will be sold to Fuxin Kinescope plant in Fuzhou and Shanghai.

#### Macrocyclic Ligands

New lanthanide complexes with macrocyclic tetraaminotetracarboxylates are attracting much attention as potential chemicals for separating the rare earths, as magnetic resonance imaging contrast-enhancing agents and as radiopharmaceuticals. These macrocyclic ligands generally form more stable complexes than their linear, more commonly known, analogues EDTA (ethylenediamine tetraacetate) and DTPA (diethylenetriamine pentaacetate), but their complexation rates are much slower. In general the tighter the ring size, the slower the encapsulation rate, and this may limit their practical use, especially as chelating agents for separating the rare earths. A Japanese team of scientists from three different laboratories, have synthesized two new macrocyclic compounds which have complexation rates faster than some of the older macrocyclic ligands, and still maintain their chemical stability [M. Kodama, *et al.* Inorg. Chem. 30, 1270 (1991)]. These two new compounds are pentaamino pentacarboxylate (PEPA) and hexaamino hexacarboxylate (HEHA). Of the two HEHA is superior to PEPA, and its (HEHA) stability is comparable to DTPA but its complexation rate, however, is ten times slower than that of DTPA, but 100 times faster than the best of the older macrocyclic complexes. The stability constants (K) for HEHA-lanthanide complexes vary in a more linear fashion as a function of the atomic number of the lanthanide element than DTPA, and does not tend to level-off or even curve over for the heavy lanthanides as does DTPA. Furthermore the slope of the log K vs. atomic number is steeper for HEHA than for DTPA. All of these properties (except for slower complexation rate) suggest that HEHA might be a good chelating agent for separating rare earths, possibly better than DTPA. Continued research on these macrocyclic ligands may lead to a more efficient, and thus a lower cost, separation process for the rare earths. The authors give details on the syntheses, thermodynamic stabilities, and kinetic data for complex formation rates of PEPA and HEHA.

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