Gd
Eu Tb
Sm Dy
Pm Ho
RARVS
Nd Er
Pr Tm
Ce Yb
La Sc Y Lu

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75 Years of Rare Earths Comes to an End

After 75 years in the rare earth business, Ronson Metals Corp. of Newark, New Jersey, a subsidiary of Ronson Corp., ended its production of mischmetal in June and has begun to dismantle its production facilities. Over the next few months they will be cleaning up the plant and grounds to assure that the facility is environmentally safe.

Ronson has been manufacturing rare earth metals since 1915 and at one time was the largest in the rare earth business. The company produced mischmetal for lighter flints, as alloy additives for steel, magnesium, etc., and for use in zinc plating. The assets of the company are being sold, but the final details are currently under negotiation.

Ronson Metals Corp. was one of the five original benefactors of RIC and they supported us unflinchingly for 22 years - for which we are extremely thankful. Thus, as the door of one of the pioneering companies in the rare earth industry closes, we feel pangs of anguish in our hearts.

Electric Solvent Extraction

A new solvent extraction technology, which was developed at Oak Ridge National Laboratory, may be the next major advance in separating rare earths. Scientists T. C. Scott and R. M. Wham have demonstrated that it is possible to extract an organic phase (acetic acid) dissolved in water into a non-aqueous phase (methyl isobutyl ketone) more efficiently than by using standard laboratory-scale extraction units by a factor of 10 to 17. In addition, because of this higher efficiency, the separation process can be carried out in smaller units than in conventional solvent extractors.

In the method, the aqueous phase passes through a nozzle between two electrodes where a pulsed high-intensity electric field (> 1 kV/cm) shatters the water particles into tiny droplets which flow counter current through the organic solvent. Because of the larger surface area of the tiny droplets, transfer of the acetic acid from the water to the ketone is much more effective than the mechanical agitation step used for mixing the aqueous and non-aqueous phases. The pulsed electric field operates between 20 and 60 Hz and is matched to the electric field strength to shatter the water bubbles to droplets ranging from 1 to 10 μm in size with an average of 5 μm. The authors estimate that the energy to generate the electric field is about 1%

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that of the energy to operate a stirred tank. Scott and Wham note that this method is limited to fluid pairs with the appropriate electrical properties, but many of the existing pairs utilized in industry meet this requirement. This process was patented in the U.S.A. on August 30, 1988, Number 4,767,515.

Although the authors have successfully demonstrated the extraction of acetic acid from the aqueous phase to the immiscible organic phase, they have not yet used this technique to separate two metals from one another. But in principle it should be possible to do this, including the rare earth metals. Any company involved in the separation of the rare earths should seriously look into this technology. If it works, the cost of separating rare earths could drop by a factor 10 or more. Those companies using separated rare earths should not look for these cost savings until the 21st century - there are a lot of technical hurdles to be overcome before the individual rare earths become that cheap.

Blue Laser

The long sought after blue laser may be at hand. IBM scientists at the Almaden Research Center (W. Leuth, R. M. Macfarlane and co-workers) have shown that a blue laser using Er^{3+} ion, which has been pumped using infrared radiation, may be a practical reality in the not too distant future. The development of a blue laser has several important technical implications. The use of frequencies from the blue region of the spectrum will allow higher information storage densities on optical storage devices than is possible today. Also underwater detection of submarines will be greatly enhanced by the availability of this blue laser.

The new laser, a 1% Er^{3+} doped $YLiF_4$ single crystal, is pumped by using a semiconductor diode laser which lases in the red to infrared regions. After the Er^{3+} ions have been irradiated by the laser, pairs of Er^{3+} ions share their energies, and some of the electrons of Er^{3+} climb to a higher energy level, while the electrons in the other member of the pair fall to a lower energy. The electrons in the highest level ($^2P_{3/2}$) emit a blue light at 469.7 nm. The authors found that even when more than one upconversion step is needed, the pump thresholds are low, i.e. multi-upconversion steps are not necessarily inefficient. The authors initial studies were carried out at temperatures below 35K (-238°C), but this is not expected to be a fundamental limitation, and work on raising the temperature is underway.

1:2:3 Producers

Rhône-Poulenc has opened a new plant to manufacture $YBa_2Cu_3O_{7-x}$ (1:2:3) superconducting materials. The annual capacity is several tons, but can easily be increased up to ten tons per year. The plant can supply raw materials in various particle sizes and distributions, of various purities and in different ratios of the chemical constituents. A proprietary wet chemical process is used to produce the 1:2:3 superconducting materials.

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