Rare-earth Information Center INSIGHT

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FAREWELL

This is the last issue of **RIC Insight** that I will be writing. After more than 30 years of directing the Rare-earth Information Center, I will be turning over the reins to Dr. R. William (Bill) McCallum. This is not a sudden decision on my part, I have been planning it for several years in cooperation with my supervisors and key co-workers, so that the change can be made smoothly without any major disruption in the services provided by RIC. I have been wanting to devote more time to research which I find very exciting and fascinating. In this regard I have already stepped down from active classroom teaching as of the end of the spring semester last year (May 1995). My official duties as the Director of RIC ended as of the end of the last working day in January (31st, 1996). I will still be around, however, to assist Bill and the rest of the RIC staff, and if you think I can help you personally, please feel free to contact me, but Joel Calhoun will still be answering most of the inquiries directed to RIC.

Prior to my turning over the operation of RIC to Bill, several of us (Bill McCallum, David Jiles, Tim Ellis and I) have been planning a change in the mission of RIC from just an information source to encompass research capabilities and process development. The name of the Center is now the Center for Rare Earths and Magnetics (CREM), while the name Rare-earth Information Center continues to identify the information unit of the expanded Center. This change was approved by Iowa State University Board of Regents on January 17, 1996. CREM will be composed of three units: information (RIC), technology (the Rare Earth Technology Unit), and research (the Magnetic Materials Research Unit). RIC will function as it has in the past, including publishing its quarterly and monthly newsletters (**RIC News** and **RIC Insight**, respectively). A brief one page description of CREM can be obtained by writing RIC. More details concerning the operation of CREM, its goals, by-laws, etc. will become available within a few months as the preliminary draft is finalized.

NEW GLASS POLISHING JOINT VENTURE

A four-way joint venture has been set up to build a factory to produce 1200 metric tons of polishing powder a year in Baotou. The new company, Baotou Tianjiao Seimi Polishing Powder Co., Ltd., is jointly owned by Baotou Iron & Steel Co. Ltd. (55%), Seimi Chemical Co., Ltd. (30%), Okura & Co. Ltd. (10%) and Chugai Steel & Rare Earth Co., Ltd. (5%). Baotou Iron & Steel is well known in the rare earth field since it owns the large Baiyunebo mine, near Baotou, People's Republic of China, and processes much of the rare earth materials used today. Seimi Chemical Co., located in Chigasaki-City, Kanagawa Prefecture, Japan, is a subsidiary of Asahi Glass Co., Ltd. Okura & Co. is a major Japanese trading firm located in Tokyo, Japan, while Chugai Steel & Rare Earth is the Japanese agent for Baotou Iron & Steel and is also located in Tokyo. The cost of the new plant is $6.5M (US), and construction will begin in April 1996, with production commencing in early 1997. Baotou Iron & Steel will supply the raw material from their rare earth production

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facilities, and Seimi Chemical will supply the technology and know-how for the production of the polishing powder. Okura and Chugai will be in charge of overseas trade. Initially, the polishing powders will be consumed in Japan, South East Asia and in the People's Republic of China. The major use of this product is for polishing TV bulb glass and plate glass. According to Seimi Chemical Co., this is the first joint venture in the rare earth field between Japan and the People's Republic of China.

CRUCIBLE MATERIAL FOR $YBa_2Cu_3O_{7-x}$

Swiss scientists report a breakthrough on a new crucible material, $BaZrO_3$, which is not attacked by the molten $YBa_2Cu_3O_{7-x}$ (1:2:3) superconductor. This development should spur the development of better 1:2:3 superconductor materials for technological and industrial applications. Not only is it possible to grow single crystals, but it also means that the corrosion of the crucible during the melt is avoided, and thus overcoming the heretofore problem of the liquid composition changing during melting operations giving rise to uncontrollable growth conditions. These results were reported by A. Erb and co-workers (Université de Genève) in **Physica C 245**, 245-251 (1995).

This development allowed the Université de Genève scientists (I. Maggio-Aprile *et al*, **Phys. Rev. Lett. 75**, 2754-2757 (1995)] to image vortex cores by tunneling spectroscopy, the first time this has been done on the 1:2:3 material. A three dimensional differential conductance spectra is given in black and white in the **Phys. Rev. Lett**. article, but a full color version was presented in **Phys. Today 48**, [11] 19 (November 1995).

ENHANCED REMANENCE MAGNETIC ALLOY

In many applications, such as bonded permanent magnets for motors, magnetic materials with a high remanence (>9.0 kG) with a reasonable coercivity (>7 kOe) are needed. T. Yoneyama and co-workers from TDK Corporation, Chiba-ken, Japan, describe their efforts to produce such a magnet material by alloying Sm-Fe-N with Zr and Co [**Appl. Phys. Lett. 67**, 3197-3199 (1995)]. Alloy compositions of Sm (5-10 at.%), Zr (0-4 at.%), Co (0-10 at.%) and Fe (95-76 at.%) were prepared by induction melting and rapidly quenching in an argon atmosphere. A nanoscale mixture of $SmFe_7N$ and α-Fe was prepared by heat treatment of the overquenched powder samples with a particle size <100 µm at 700-750°C, and then nitrogenated at 450°C. For the $Sm_xZr_3Fe_{97-x}N$ alloys the peak coercivity of 10.5 kOe was obtained at a samarium concentration of 0.09, the peak remanence of ~9.5 kG was found at x = 0.06. The maximum energy product value of 13 MGOe was also found at x = 0.07. The nitrogen contents of these alloys needed to be greater than 10 at.% to have a reasonable coercivity (i.e. > 8 kOe). Above 12 at.% N the coercivity saturated at a value of ~9.8 kOe. The addition of cobalt had little effect on the remanence but increased the coercivity by as much as 50%. The authors believe that the high remanence is due to the small grain size and exchange coupling at the $SmFe_7$ and α-Fe interfaces. The final permanent magnet material is isotropic. Furthermore, the authors suggest that by reducing the grain size even further by controlling the microstructure, higher coercivities, remanences and energy products could be realized in these materials.

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