Rare-earth Information Center INSIGHT

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Ferritic RE Stainless Steel

Allegheny Ludlum Steel Division of Allegheny Ludlum Corporation, Pittsburgh, Pennsylvania has developed a new ferritic stainless steel alloy (called Alfa-IV) for preheated catalytic converters. These converters are electrically preheated by the car's battery during the cold-start portion of the driving cycle, during which time 50 to 70% of the vehicle's emissions are produced. The key to the operation of the catalytic converter is a coated and catalyzed honeycomb substrate, where oxidation resistance is critical to prevent spalling of the precious metal catalyst coatings. The typical composition of Alfa-IV is 20 wt.% Cr, 5Al, 0.02C and 0.02 Ce+La (with Ce:La=2:1) with the remainder iron. The metal honeycomb substrate is necessary in order to electrically heat the catalyst to a temperature of 345°C in 7 to 15 seconds depending upon the size of the catalytic exhaust system -- about 5 kW of power are needed. Ceramic substrate converters cannot be preheated because of the large drain of the battery, and because they take several minutes to reach the 345°C operating temperature. The preheated catalytic converters will be required to meet the lower emission standards being imposed by many states in the United States, which is being led by California. The new standards are sure to follow in a few years in both Europe and Japan.

This is good news. The bad news is that as the ceramic catalytic converters are being replaced, this will result in a reduction in the amount of rare earths, primarily CeO_2 and La_2O_3, being used in this important market.

MEGON → EXTRATEC

During the past year MEGON AS has undergone some major changes which culminated in early January 1992. In March 1991 a new company, EXTRATEC AS, was established as a result of a spin-off of all the technical and consulting activities from MEGON. EXTRATEC will focus on the development of (1) extraction and purification processes for rare earths and other minerals and metals, and (2) processes to extract pollutants and/or recover valuable elements from industrial waste. They will also offer consulting services, strategic planning and marketing studies. MEGON, which closed its production plant at Kjeller, will continue to produce and supply high purity Y_2O_3 in a new production line. Per H. Dybwad, who has been appointed chairman of MEGON, will continue as managing director of EXTRATEC. Gunnar Norum has been appointed the new managing director of MEGON. Both companies are wholly owned by Norsk Hydro, and occupy neighboring offices in Oslo.

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High T_c Superconductors -- Recent Developments

According to recent issues of our sister publication, **High T_c Update**, several researchers have found that the Tl-1223 high temperature superconductor, $TlBa_2Ca_2Cu_3O_x$, has a surprisingly high critical current density which is reasonably competitive with that of the $YBa_2Cu_3O_{7-x}$ (1:2:3) superconductor. Since Tl-1223 has a superconducting transition temperature about 25K higher than that of the 1:2:3 (115 vs. 91K), many believe that the Tl-1223 material has a greater promise for technical applications. As noted by **High T_c Update**, since both have superconducting transition temperatures above liquid nitrogen (77K), the material which will be easier to process into a final bulk form, such as a wire, will probably win the bigger market share. However, most likely both will be used commercially.

Advances on joining the 1:2:3 superconductor has been reported by two groups. The Texas Center for Superconductivity, University of Texas group has developed a solid-state process of joining high-current density bulk samples of $YBa_2Cu_3O_{7-x}$ prepared by melt processing. The authors, K. Salama and V. Selvamanickam, found that the interface between joined samples sustained current densities greater than 6×10^3 A/cm^2 at 77K and zero magnetic field. The second group from Ohio State University, connected the 1:2:3 ceramic superconducting bars by a fusion welding technique using a calcined powder as a filler. The welded bars had good mechanical integrity and after heat treatment the resistivity had a sharp drop at 90K, but it did not go to zero. The authors, M. J. Sturm, Z. A. Chaudbury and S. A. Akbar, thought this was due to impurity phases and pores in the welded zone.

Competition in International Trade

Since most of RIC's supporters are involved in international trade, regardless of whether they are a U.S.A. company or a non-U.S.A. organization, you might find Prof. Paul A. Krugman's article [**Science, 254**, 811 (1991)] on "Myths and Realities of U.S. Competitiveness" interesting reading. Krugman maintains that discussions which focus "on the trade deficit and on fears that an economy whose productivity lags that of its rivals will face economic disaster" are misdirected and that these persons do not understand the various forces that are at play. He believes that various underlying forces will ensure that the U.S. economy will remain in business and indeed roughly balance its trade even if the productivity of the country is dismal.

This is not to say that individual companies, or even certain markets, will not suffer, but in the long run, overall, things will balance out. Almost everything in this world obeys a sine wave function -- there are ups and downs. In time things will change, the main problem is we cannot predict with any reliability the amplitudes nor the frequency (the distance [time] between peaks or valleys). Right now most economies and markets (including the rare earths overall, but not all individual sectors) are in the trough of the sine wave. Hopefully we are starting to move back up. The competition, however, will still be there -- but remember it is the competition that makes us improve, move forward, and become "better".

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