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CENTER INSIGHT

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Volume 2 September 1, 1989 No. 9

China Statistics - Correction

In the July 1, 1989 issue of RIC Insight we stated that the 1988 mine production was up by 38% to 20840 metric tons REO equivalent. The correct number should be 29640 metric tons of rare earth concentrate. The amount of rare earth products produced in 1988 was 18660 metric tons of REO equivalent.

WIM-150 Mineral Sand Project

More details on the large western Victoria (Australia) minerals sand deposit have been released. The WIM-150 deposit is located about 300 km northwest of Melbourne, 15 km southeast of Horsham. WIM stands for Wimmera Industrial Minerals, which is a business unit of CRA Ltd. The proven reserves today amount to 580,000 mt of monazite and 170,000 mt of xenotime, in addition to the usual rutile, ilmenite and zircon minerals. The addition of these amounts of rare earths to the known reserves plus the preliminary amounts from the Carr Boyd Mt. Weld deposit (see the last issue of **RIC Insight**) puts Australia's rare earth reserves slightly ahead of those of India into third place behind the U.S.A. (No. 2) and People's Republic of China (No. 1). In addition, CRA believes there are other deposits similar to WIM-150 in several locations in western Victoria.

The mineral grain size of the WIM-150 deposit is extremely fine, averaging about 50 microns, about 2 to 4 times smaller than that for most heavy mineral grains. This small grain size makes it difficult to separate the various minerals by the usual gravity and electrostatic methods. Apparently this difficulty has been overcome by using a flotation process to concentrate and separate the minerals. The initial target production is 12,000 tons of monazite per year, and would account for ~ 10% of the earned revenues. A decision will be made in 1991 whether to mine the deposit or not. If in the affirmative, commercial production would commence in 1993, about ten years after the initial discovery of the WIM-150 deposit.

Y_2O_3 dispersed Titanium Alloys

A great deal of work is being carried out in several countries on high strength oxide dispersed titanium alloys for the aircraft industry. The alloys are produced by rapid solidification of liquid titanium containing yttrium, which subsequently oxidizes by reaction with the interstitial oxygen in the titanium. The resultant alloys consist of a fine dispersion (< 50

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nm) of Y_2O_3 in the titanium-base alloys. The dispersion is stable in the α-phase temperature region (usually $< 850°C$) but not in the β phase region. The small oxide particles are coherent with the matrix, even during hot consolidation or heat treatment in the α phase field. When heated in the β phase field the oxide particles coarsen rapidly to ~0.4 μm, lose coherency, and thus their effectiveness in improving the mechanical properties of the titanium alloys.

The nominal compositions of the alloys tested to date vary from 0.74 to 1.84 wt.% Y, where the former amount is sufficient to give stoichiometric Y_2O_3 from the oxygen contained in T40 grade titanium (0.6 at.%). The addition of 1.84% Y improved the 0.2% proof stress by ~ 25% over the unalloyed Ti metal from ~ 0 to 500°C.

New Optical Materials

From studies of the absorption, emission and excitation spectra of Ce-doped Gd_2SiO_5 (GSO) single crystals M. Sekita et al. [J. Appl. Phys. 66 373 (1989)] concluded that this material is suitable for use as a scintillation detector. The emission spectrum from the 5d to 4f transitions in Ce^{3+} has a maximum at 437 nm which matches well with the high-sensitivity region of the spectral response of the photomultiplier tubes used in scintillation detectors. The fluorescence decay time is ~ 60 ns and it increases with increasing Ce concentration, which was studied from 0.2 to 2% Ce. The GSO material is nonhygroscopic and has a high density - two important criteria for this application. The most important phosphor used today is NaI doped with Tl, but it suffers the drawback that it is hygroscopic and must be protected from the water vapor in the air. If the low light output of GSO [~20% of the NaI(Tl)] can be increased, it will replace NaI(Tl) for detecting x-rays and γ-rays. There is a considerable market for these scintillating materials in medical instruments, such as x-ray computed tomography (CT). The CT instruments require a small and fast decay x-ray (or γ-ray) detector in the form of an array.

In the same issue, A. Locam and C. Chateau, [J. Appl. Phys. **66**, 366 (1989)] proposed that the Sm^{2+}-doped SrB_4O_7 phosphor (SBO) be used as an optical pressure gauge for diamond anvil cells, replacing ruby. SBO has a narrow (1.5Å wide), well-isolated emission line at 6854Å due to a singlet transition ($^5D_0$ to $^7F_0$) in the $4f^6$ configuration of Sm^{2+}. Ruby has a doublet transition at 6942Å with a 7.5Å linewidth. The pressure shift of these fluorescence lines is used for measuring the pressure. Although the shift of the ruby line (+ 0.365Å/kbar) is larger than that of SBO (+ 0.255Å/kbar), the temperature sensitivity of SBO is significantly lower -0.001Å/°C than that of ruby (+ 0.068), thus there is less likelihood of introducing errors due to unwanted heating by too-high-power excitation. Furthermore, SBO can be used to simultaneously measure both the pressure and temperature (at least up to 400°C) in the diamond anvil cell.

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