



# RARE-EARTH INFORMATION CENTER INSIGHT

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## Conference News

Two meetings involving rare earths were held on the same days in late February only a few hundred miles apart. One was a special symposium on the extraction, preparation and application of rare earths, which was a part of the TMS (The Minerals, Metals and Materials Society) Annual Meeting held in Las Vegas, NV (February 27-29, 1989). The other was the Nd-Fe-B Magnet Market meeting in Monterey, CA (February 26-28, 1989). Some highlights from each are presented below.

### Aluminum-Graphite Composites

The addition of graphite to aluminum to make composites with superior properties has been difficult because of poor wetting of the dispersoid (carbon) by the alloy matrix, leading to poor bonding between the two components and a non-uniform distribution of the carbon particles. The addition of Mg or Li leads to improved wetting and bonding, and thus, improved mechanical properties. As reported at the rare earth symposium at the TMS meeting, Indian scientists headed by R. Upadhyaya found that small additions of mischmetal (1 to 3 wt.%) improved the incorporation of the graphite dispersoid into the aluminum metal matrix. The use of mischmetal increased the ultimate tensile strength by about 20% over the non-rare earth metal treated graphite-aluminum matrix (from 9-12 kg/mm<sup>2</sup> to 11-15 kg/mm<sup>2</sup>). Furthermore, the mischmetal addition allowed one to greatly extend the volume fraction of the graphite particles in the matrix from 5-6 wt.% to 30% for carbon fibers and to 60% for coarse graphite powders. The exact mechanism and the role of the rare earths on the dispersion process are not yet well understood.

### Nd-Fe-B Patents Situation

The Nd-Fe-B base permanent magnet patent situation seems to be settling out, according to J. Johnson of IG Technologies, Inc., who was one of the speakers at the Gorham Advanced Materials Institute Conference on Nd-Fe-B Markets. The most significant development was the November 1988 announcement that General Motors (GM) and Sumitomo Special Metals (SSM) had reached a settlement concerning GM's lawsuit against SSM, which was filed in 1987. Details concerning the settlement are still unavailable, but news releases indicate that SSM recognizes GM's composition claims in the USA, while GM recognizes SSM's composition claims in Japan and Europe. It is RIC's understanding that GM holds the composition rights in Australia.

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Johnson believes that all magnet manufacturers, if they do not have a license from either GM or SSM (his company has them from both), should obtain such a license to manufacture the Nd-Fe-B magnets. In a talk presented by M. Yokokura of Sumitomo Special Metals America, Inc., it was noted that eight companies (3 in Japan, 4 in Europe and 1 in the USA) have been licensed by SSM to manufacture their proprietary "Neomax" material. Port Wheeler of Wheeler Associates, Inc. noted that there are 11 GM/SSM licenses, which account for 50% of the world market.

At this time it appears that alloy manufacturers do not need to obtain a license to make the Nd-Fe-B material, since the material needs to be further processed to obtain the desired permanent magnet properties.

#### Nd-Fe-B Markets

Several papers (5 of the 23 presented at the Conference) dealt with the permanent magnet markets, both current and future. The 1988 Nd-Fe-B market was a record with a growth of 15% over 1987. The major free world markets for the neodymium magnets are: voice coil motors (VCM) for computer disk drives 51%, magnetic resonance imaging (medical NMR scanners) 23%, motors and generators 12%, and miscellaneous 14%. The actual amount of Nd-Fe-B magnet material consumed was 1,020 metric tons worth \$255M, or about 10% of the total permanent market in terms of value. The Sm-Co portion of the market amounted to about 20%, while ferrites and alincos accounted for 59% and 10%, respectively. Bonded permanent magnets account for the major share of the Nd-Fe-B market today and it is expected to grow faster than the fully dense magnet materials.

The 15% growth rate is expected to continue into the early 1990's and then slow down towards the end of the century. By 1997, the Nd-Fe-B share of the market is predicted to account for 40% of the total value of the permanent magnet market with the ferrite share dropping to 50% and the Sm-Co and alincos making up the remaining 10%. The markets for Nd-Fe-B magnets will differ considerably by 1992 with motors and generators, other than VCM and spindle motors for hard disk drives, accounting for ~37% of the Nd-Fe-B consumed, while acoustic devices (speakers and communication) will account for ~10%. The computer utilization share is anticipated to be 45%, down from the current 51%.

#### Clarification - Competition Is Heating Up!

In the June 1, 1988 issue of RIC Insight (Vol. 1, No. 4) we implied that the Olympic Dam deposit in South Australia would begin to produce rare earths in 1988. Actually the initial production only involved copper, uranium, gold and silver. Although the deposit contains rare earths, they are not being extracted at the present time.

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