RARE-EARTH INFORMATION CENTER INSIGHT

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RIC Inaugurates a New Service

The Rare-earth Information Center is beginning a new, limited distribution bulletin beginning with the item you are now reading. This bulletin is called RIC Insight and will be one or two pages long. We are planning to publish it once a month, provided we have sufficient news or information we wish to bring to your attention. RIC Insight is being sent only to those companies, or institutions who are supporting the Information Center. If anyone else wishes to receive Insight, all they have to do is to become a benefactor of RIC.

This new bulletin will have no effect on the RIC News, we will continue to publish it as we have in the past — quarterly with 4 to 8 pages per issue. The RIC News has over 7800 subscribers. In contrast RIC Insight will be distributed to the 125+ benefactors of RIC.

As you are well aware, over the last few years there have been many new and fast-moving developments in the science and technology of the rare earths. This has presented difficulties for the RIC News — information is out dated when we go to press and we lack space to include all the material we would like in each issue of the RIC News. With this new bulletin, at least we will get some of the latest developments into your hands faster than through the RIC News. In some cases this information may never appear in the RIC News. Furthermore, as the name implies we plan to give you our views and perspectives of various aspects of the rare earth field, i.e. more editorializing than we have been able to do in the RIC News.

Corrosion

A fairly recent development that needs to be watched closely is the use of rare earths as inhibitors in aqueous corrosion and as coatings for corrosion protection. At this stage of research and development the rare earths look extremely promising and exciting. This could be one of the big markets for the rare earths in the mid- to late-1990's and beyond. Corrosion protection is a multi-billion dollar industry, and just a small fraction of this market could be one of the biggest rare earth markets volumewise. The big impetus for the rare earths in corrosion protection is to replace many of the environmentally unacceptable materials currently used by materials which are non-toxic (and the rare earths are among them) and still afford good corrosion protection, which the rare earths do surprisingly well.

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More details will be found in my trip report to Australia, see the bottom of p. 1, column 1 in the March 1 issue of the RIC News, which you will be receiving in a few days. If you want copies of the papers (4 of them) published by B. R. W. Hinton and co-workers at the Aeronautical Research Laboratories in Melbourne, Australia just let us know and we will send them to you.

A New Rare-earth Permanent Magnet Material?

A recent study carried out by B. de Mooij and K. H. J. Buschow [Philips J. Res. **42**, 246-51 (1987)] found a new iron-rich rare earth ternary compound which may give some competition to the $Nd_2Fe_{14}B$ permanent magnets. These new phases have the composition $RFe_{10}V_2$ and crystallize in the tetragonal $ThMn_{12}$ structure. de Mooij and Buschow report that the Curie temperatures vary from 203°C for the Lu compound to 362°C for Gd and that they are strong ferromagnets. They also found that the Fe to V ratio can vary from 9.5:2.5 to 10.5:1.5, which can lead to increased Curie temperatures in the higher Fe containing alloys. The compounds are reported to exist for the trivalent lanthanides from Nd to Lu, excepting Pm which was not prepared because of its radioactivity. They also note that La and Pr do not form this phase, nothing was said about Ce.

Preliminary measurements indicate that the anisotropy fields are comparable to those of the $R_2Fe_{14}B$ materials. If further studies verify these initial findings, the $Nd_2Fe_{14}B$ materials may have a strong competitor and the $RFe_{10}V_2$ phases will become the third member of the rare-earth permanent magnet family along with $SmCo_5$—Sm_2Co_{17} and $Nd_2Fe_{14}B$.

Non-rare-earth High T_c Superconducting Competitor

A new high T_c superconductor containing Bi-Ca-Sr-Cu-O has been reported by several groups in the USA and Japan to have a large resistance drop starting at ~120K and finally becoming superconducting (zero resistance) at ~80K. The composition of this new phase is approximately $Bi_2Sr_{3-x}Ca_xCu_2O_{8+y}$ and it is orthorhombic. Preliminary reports indicate that the new superconductor does not need to be oxygen annealed at low temperature (~500°C) as does the $YBa_2Cu_3O_{7-x}$ (1:2:3) high temperature superconducting phase, and that it behaves like a clay, rather than a brittle ceramic, which suggests that the material may be more easily fabricated than 1:2:3. Of course, the new material is made up of cheaper components Bi_2O_3 vs. Y_2O_3 or R_2O_3, and CaO and SrO vs. BaO. It is too early to tell whether or not these good properties of the Ba-Ca-Sr-Cu-O material will hold-up as we learn more about this new superconductor. If they do there is a good possibility that they will replace the 1:2:3 materials. Two other important properties (the critical field and critical current), which are more important than those noted above, need to be measured and if these are as good as those of the $YBa_2Cu_3O_{7-x}$ phase then it will be a strong competitor and could displace all or part of this rare earth market. We will keep you informed of developments as they occur.

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