Gd Eu Tb Sm Dy Pm Ho RARVS Nd Er Pr Tm Ce Yb La Sc Y Lu

Rare-earth Information Center Insight

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Colossal Isotope Shift

Isotope shifts in a material's property are the changes that result in that property when one isotope of an element is replaced by another. Since the ionic charge and size do not vary for the isotopes of the same element, only the mass changes. For light elements, such as O, this mass change can be fairly large, i.e. ^{16}O to ^{18}O. The only properties, which are believed to be affected by isotope changes, are those which depend on the vibrational frequencies or phonon spectrum on the lattice. These changes are usually quite small, requiring precision measurements. In light of this, the report of G. Zhao et al. {*J. Phys.: Cond. Mat.*, **10**, L737-L742 (1998)} of a colossal oxygen isotope shift for the charge-ordering transition temperature, T_{CO}, in $Nd_{0.5}Sr_{0.5}MnO_3$ is rather surprising. Above T_{CO}, $Nd_{0.5}Sr_{0.5}MnO_3$ is a ferromagnet, while below it is non-magnetic. This allows T_{CO} to be easily monitored. The difference in T_{CO} samples with 95% ^{18}O and 5% ^{16}O and the ~100% ^{16}O samples is 21 K out of about 130 K. This colossal isotope shift is inconsistent with all proposed mechanisms for the charge-ordering transition.

d-Wave Review

Since the discovery of high-temperature superconductivity (HTSC), the symmetry of the superconducting state has been of great interest. Conventional low-temperature superconductors have a *s*-state pairing that is spherically symmetric. Various results for high-temperature superconductors have not been consistent with *s*-state pair, and there has been considerable work done, both theoretically and experimentally, to determine the nature of the pairing for HTSC. Technologically, this is an important piece of information as it determines the extreme values that can be obtained for properties such as surface impedance. Within the last few years, it has been accepted that *d*-wave pair occurs in many HTSC's. Recently, G. G. Sergeeva et al. {*Low Temp Phys.*, **24**, 771-81 (1998)} have prepared a review of the work on *d*-wave pairing, which brings together both theoretical and experimental results and points out some of the consequences of *d*-wave pairing.

SHORT NOTES

The December 23, 1998 issue of *Japan Times* reports that Honda Motor Company plans to introduce its first hybrid car in the fall of 1999. The car features a lean burn 1-liter gasoline engine and a battery-operated electric motor. The car has an aluminum chassis, is largely Al and plastic, and weighs 800 kg. Fuel economy is reported to be 30 km/liter (70 mpg). While not given in this report, I believe the batteries will be Ni-MH.

The *Jpn. New Mater. Rpt.* **13**, {5}, 3 (1998) contains two reports of interest to the rare earth community. Hitachi, Ltd. has developed an 8MGOe bonded magnet based on Sm-Fe-N. The Sm-Fe-N material is

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reported to have an enhanced corrosion resistance over Nd-Fe-B and a temperature coefficient half that of Nd-Fe-B. The particle size for the Sm-Fe-N is claimed to be finer than that of Nd-Fe-B powders, which should allow improvements in casting precision parts. Hitachi expects to be able to achieve 10 MGOe by next March. The company holds Japanese patents on both the composition and production process for the new magnets. Sample shipments are scheduled to begin in March, and the company projects sales of U.S. $4.2 million in 2000.

The Metal Materials Research Laboratory of Tohoku University and Victor Company of Japan have developed a process to produce lanthanum tantalate gallium (LTG) single crystals, 50mm in diameter and 170mm in length. The crystals are said to be highly uniform. LTG has outstanding piezoelectric properties. The researchers are currently scaling the crystal drawing operation to produce 3-inch diameter crystals and are developing specific applications.

YBM

As was reported in a special *Insight* last month, on December 8, 1998, Ernst & Young was appointed receiver and manager of YBM Magnex International, Inc. (YBM). Following that action, YBM's shares were delisted from the Toronto Stock Exchange on December 15, 1998. Now, a number of law firms including Barrack, Rodos & Bacine; Beatie and Osborn LLP; Berger & Montague, P.C.; and Milberg Weiss Bershad Hynes & Lerach LLP have filed class action law suits. The law suits name YBM, certain of its senior officers, its auditors, Deloitte and Touche LLP, First Marathon Securities Ltd. and Griffiths McBurney & Partners for violations of the Securities Exchange Act of 1934. The complaints allege that YBM, through one or more of its subsidiaries, engaged in a continuous practice of laundering money accumulated by organized criminal activities in Russia and that the principal auditor for YBM, Deloitte, had received repeated notices about money laundering activities, which were recklessly disregarded.

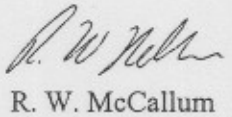
The fate of YBM is important to the rare earth community, as YBM had acquired both Crucible Magnetics, now Crumax Magnetics Inc., and the Philips Electronics rare earth permanent magnet business in Southport and Burscough, England, now Crumax Magnetics, Ltd. As of this writing, YBM is operating under the direction of Ernst & Young, and I have confirmed that these divisions continue to produce and sell magnets.

MQI

Magnequench International, Inc. has announced that it will open a European office in Tubingen, Germany to serve as a sales and customer service center for its magnetic powders and magnet products. The General Manager of the office is Dr. Bernd Grieb. The center will have a laboratory equipped for magnetic testing and other measurements. Contact: Dr. Bernd Grieb, Telephone: 49 (0) 7071-400-635, Fax: 49 (0) 7071-400-641.

RIC

Visit the RIC website: http://external.ameslab.gov/ric.



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