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BULK MAGNETS - I

C-TUE-04

STRUCTURE AND MAGNETIC PROPERTIES OF MECHANICAL ALLOYED Sm-Fe-Ti COMPOUNDS AND THEIR NITRIDES, H.T. KIM, T.K. KIM, and H.M. KWON(Dept. of Metal. Eng., Chungnam National Univ., Taejon, 306-764, Korea), Y.C. SUI, W. LIU. Z.D. ZHANG, Q.F. XIAO (Inst. of Metal Research, Academia Sinica, Shenyang, 110015, P.R.China)

The mechanical alloyed $TbCu_7$-type $Sm_{12.5}Fe_{87.5-x}Ti_x$(x=0, 2.5, 5, 7.5), and their nitrides have been studied systematically by X-ray diffraction, A.C. initial susceptibility, and pulsed magnetization measurement. In $Sm_{12.5}Fe_{87.5-x}Ti_xN_y$ series, the volume expansion is of 5.6 %~7.3 %, and the increment of the Curie temperature is in the range of 210 °C~350 °C. With increasing Ti content, the remanence decreases linearly due to the substitution of non-magnetic Ti element, and the coercivity decreases rapidly from 34.6 kA/cm (43.5 kOe) for x=0 to 14.3 kA/cm (18 kOe) for x=7.5. Among $Sm_{12.5}Fe_{87.5-x}Ti_xN_y$ series, the best properties were obtained on the $Sm_{12.5}Fe_{87.5}N_y$ (x=0) with $_iH_c$=34.6 kA/cm (43.5 kOe), B_r=0.75 T, and $(BH)_{max}$=113.8 kJ/m^3 (10.9 MG·Oe). In addition, The $TbCu_7$-type $Sm_{10}Fe_{85}Ti_5$ sample annealed at 700 °C for 0.5h. shows moderate coercivity of 1.8 kA/cm (2.3 kOe).

C-TUE-05

THE EFFECT OF SILICON ADDITION IN THE MECHANICAL ALLOYING OF FeB POWDER, Y. HWANG, T.S. KIM*, S.J. Oh**, H.S. LEE, H.S. CHUNG and S.J. Kwon** (Korea Institute of Geology, Mining & Materials, Daejon, Korea), (*Korea Atomic Energy Research Institute, Daejon, Korea), (**Pohang University of Science and Technology)

FeB powders were prepared by mechanical alloying, and the crystal structure, phase analysis and magnetic properties were investigated by using XRD, DSC, Mössbauer spectroscopy and VSM. The starting elements, Fe and Si, are incorporated into α-Fe structure during the mechanical alloying of FeB composition in argon atmosphere. After the annealing of 250 hours-milled powder at 800℃ in vacuum, two phases of FeB and Fe_2B are found to coexist. It is revealed that the formation of Fe_2B phase can be restricted by substituting small amount of Si for B. Silicon also enhances the amorphization of FeB powders and reduces the synthesis time by mechanical alloying. As the amount of substituted Si increases, Fe_5SiB_2, $Fe_2Si_{0.4}B_{0.6}$ and paramagnetic phases begin to appear.

C-TUE-06

ELASTIC BEHAVIOUR OF MONOVALENT AND DIVALENT DOPED Sr-Zn W-TYPE HEXAGONAL FERRITES, Y.PURUSHOTHAM and P.VENUGOPAL REDDY (Department of Physics, Osmania University, Hyderabad-500 007, India)

The longitudinal and shear wave velocities of Li^{1+} and Co^{2+} substituted Sr-Zn W-type hexagonal ferrites were determined at room temperature using the ultrasonic pulse transmission technique. As the porosities of both the group of materials are found to range from 11 to 20%, the experimentally determined Young's (E), rigidity (n) moduli values do not have any significance unless they are corrected to zero porosity. Therefore, all the elastic moduli have been corrected to theoretical density, using Ledbetter and Datta's model [1]. The elastic moduli (E_o & n_o) of both the groups are found to increase continuously with increasing dopant's concentration. Similarly, Debye temperature (θ_D) values of both the series of materials are also found to vary linearly with average sound velocity (V_m). The variation of elastic moduli and Debye temperature with increasing dopant's concentration have been interpreted in terms of interionic distances of the ferrite material.

[1] H.Ledbetter and S.Datta, *J.Acoust.Soc.Amer.* 79 (1986) 239.

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SUPERCONDUCTORS

C-TUE-07

BULK SUPERCONDUCTOR AS STRONG QUASI-PERMANENT MAGNET, M. MURAKAMI and N. SAKAI (ISTEC, Superconductivity Research Laboratory, 1-16-25 Shibaura, Minato-ku, Tokyo 105-0023, Japan), S.I. Yoo (School of Mater. Sci.& Eng., Seoul National Univ., Seoul 151-742, Korea)

Recent progress in melt processing has enabled us to grow a large single-grain bulk RE-Ba-Cu-O (RE: rare earth elements) superconductors with large critical current densities. Such bulk superconductors can trap large fields much higher than those of conventional permanent magnets. A magnetic field over 10T has already been trapped in melt-processed Y-Ba-Cu-O at 45K, however, the trapped field strength at 77K is around 1.5T, which may be achievable with conventional Fe-Nd-B magnets, so that an increase in field trapping capablility is desirable at 77K to facilitate the applications of bulk superconducting magnets. The trapped field (H) is a function of the critical current density (J_c) and the single domain size (r) and can be described as follows: $H = A J_c r$, where A is a constant which depends on the sample geometry. Here it is also important to note that H is also restricted by the irreversibility field (H_{irr}). The H_{irr} value of Y-Ba-Cu-O at 77K is around 4 - 5T at 77K for fields parallel to the c axis of the crystal, which shows that the maximum trapped field cannot exceed 5T for Y-Ba-Cu-O. Recently, we have found that RE-Ba-Cu-O (RE: Nd, Sm, Eu, Gd) can exhibit H_{irr} exceeding 8T at 77K when they are melt processed in a reduced oxygen atmosphere, that is termed oxygen-controlled-melt-growth (OCMG) process. Thus OCMG processed RE-Ba-Cu-O has a high potential in field trapping capability even at 77K.