Sym. C : Electroceramics & Sensors

ELECTROCERAMICS - I

E-TUE-14

PREPARATION AND EVALUATION OF Al DOPED $ZnO-Bi_2O_3-SiO_2$ VARISTORS, A.SIL, R.GOEL and H.R. ANAND (School Of Basic and Applied Sciences Thapar Institute of Engineering & Technology)

Zinc oxide based varistors are basically polycrystalline semiconducting devices having highly non-linear current- voltage characteristics. These devices are used predominantly for circuit over voltage protection as they have very large surge tolerance capabilities. In our previous study on varistors SiO doped ZnO-BiO varistor system was investigated abd formation of ZnSiO spinel phase found in the integranular region was reported. The V-I characteristics of the samples were measured using a dc power supply. The most importaant parameter of the varistor is non-linear coefficient, α which is defined by an empirical relation, $I=KV^{\alpha}$, where I is the current and V is the applied voltage and K is a constant of proportionality. An increase in the α values was resulted in the varistors due to the addition of SiO_2 in ZnO_2-Bi_2O_3 system, The values (of α) as high as 15 were observed. As the varistor action, to a large extent, depends upon differential conductivities of grain interiors and grain boundaries, therefore in reference to our earlier work (in $ZnO-Bi_2O_3-SiO_2$ system varistors), an attempt has been made to enhance the conductivity of grain interiors in $ZnO-Bi_2O_3-SiO_2$ system varistors by adding very small amount of Al powders, typically at 125 ppm level as dopant. In the present article, we report the electrical and microstructural investigations for the varistors having a composition of ZnO-0.5 mol % Bi_2O_3-0.5 mol % SiO_2-0.0125 mol% Al. The V-I charateristics of the varistors prepared by sintering at various temperatures ranging between 1000 and 1250℃ in steps of 50℃ rise for the following time intervals of 0.5, 1.0, 1.5 and 2.0 hrs were studied. The SEM studies of the sintered specimens show that the varistors sintered at 1000℃ for 2hrs of time period have relatively smaller and uniform grain sizes with sharper grain boundaries compared to the specimens sintered at all other temperatires. The specimens(i.e. sintered at 1000℃, 2hrs) also revealed higher α values.

E-TUE-15

ZIRCONIA, PROCESSING AND PROPERTIES

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This paper is review and overview of zirconia. Zirconia is one of the important oxide ceramics. The paper describes preparation methods and properties of zirconia fine powders. There are several methods to prepare fine zirconia powederes such as (1) mechanical, (2) thermal decompesition, (3) precipitation or hydrolysis, (4) hydrothermal, (5) melting and rapid quenching, (6) etc. As for hydrothermal, (a) precipitation, (b) crystallization, (c) decomposition, (d) oxidation, (e) synthesis, (f) electrochemical, (g) mechanochemical, (h) resa, reactive electrode submerged arc, (i) hydrothermal + microwave, (j) hydrothermal+ultrasonic, (k) etc.

E-TUE-16

PULSED LASER DEPOSITED YBCO THIN FILMS USING MODIFIED MTG PROCESSED TARGETS, C. H. KIM, K. S. HONG(Dept. of Inorg. Mat. Eng, Seoul National Univ., Seoul 151-742, Korea), I. T. KIM(Div. of Ceramics, KIST, Seoul, Korea) and T. S. HAHN(Supercond. Res. Lab., KIST, Seoul, Korea)

In order to improve the surface roughness, $YBa_2Cu_3O_{7-\delta}$ (YBCO) thin films were fabricated by pulsed laser deposition technique using modified Melt-Textured-Growth (MTG) processed targets. The deposited films showed the reduced boulder density (from $10^6/cm^2$ to $10^5/cm^2$) and good superconducting properties ($T_c \sim 89K$, $J_c \geq 10^6 A/cm^2$ at 77K, zero field). To understand the surface morphology of the film, the irradiated part of the modified MTG processed target was observed by scanning electron microscopy (SEM) and compared with that of the conventionally solid-state sintered target. The microstructure of the film and the target were also investigated by transmission electron microscopy (TEM).

E-TUE-17

REENTRANT TRANSPORT TRANSITION IN OXIDE SUPERCONDUCTORS WITH QUENCHING-PROCESS, M. AKINAGA (Dept. of Phys. Fukuoka Univ. Education, Munakata, Fukuoka 811-4192, Japan), S. SUZUKI (Dept. of Geology, Fukuoka Univ. Education, Munakata, Fukuoka 811-4192, Japan) and L. Rinderer (Insti. of Exper. Phys. Univ. Lausanne, CH-1015 Lausanne-Dorigny, Switzerland)

The tetragonal $CaLaBaCu_3O_y$(CLBCO) samples, which are expected to be isomorphic to $YBa_2Cu_3O_7$-d(YBCO), were prepared for more various oxygen contents by changing annealing temperature or annealing time in O_2 gas and quenching in liquid nitrogen. The transport properties were measured in detail below usual critical temperature, T_c. The value of T_c decreases monotonically with decreasing oxygen content. The reported correlation of T_c versus oxygen content were reconfirmed again. Moreover, the reentrant transition toward a voltage state below T_c has been confirmed in the R-T curves and I-V curves for various measuring current and temperatures respectively. These reentrant behaviors are like those in "magnetic superconductors", where with decreasing temperature below T_c, second transition occurs for larger measuring current and critical current, I_c versus T curves forms a large peak. These phenomena exhibit with good reproducibility for several samples prepared by rather lower annealing temperature and liquid nitrogen quenching. In these phenomena, the inhomogeneous distribution of T_c value inside the sample due to inhomogeneous oxygen content seems to act a important role. However, the mechanism has been still now unresolved.