OP7

Material transfer dynamics of infrared (1064 nm) Nd:YAG pulsed laser deposition of yttrium doped $Bi_2Sr_2CaCu_2O_{8+d}$ thin films

Jeffrey C. de Vero*****, Glaiza Rose S. Blanca†, Jaziel R. Vitug, Wilson O Garcia, and Roland V. Sarmago**.**
National Institute of Physics, University of the Philippines, Diliman, Quezon City, Philippines 1101
*Email: jcdevero@up.edu.ph

Yttrium doped BSCCO (Bi-22Y2) films on MgO (100) were fabricated by infrared (1064 nm) Nd: YAG pulsed laser deposition with ex-situ post heat treatments. The technique comprised of pulsed laser ablation of $Bi_2Sr_2Ca_{1-x}Y_xCu_2O_{8+\delta}$ target with x = 0.01, 0.02, 0.03, and 0.05 for 180 minutes at 5.5 J/cm^2 energy fluence and 10^{-2} mbar chamber pressure. After the deposition, the as-deposited film is partially melted 930°C for 15 minutes and subsequently annealed at 850^{0}C for 5 hours in air. Molten stoichiometric blocks of Bi-22Y2 form clusters of immobile spheroids on the substrate surface. Figure 1a shows the SEM image of film at different yttrium doping concentration. EDX measurement on these films shows that stoichiometry for both target and film is the same as shown in figure 1.b. Figure 1.c. shows that the intensity of the optical emission lines yttrium is linear with the amount of the yttrium in the target. We take this to indicate that the material transfer is block-by-block and hence preserving the stoichiometry of the target to the deposited films. To promote growth on MgO substrate, films were subjected to partial melting and annealing in ambient air. Heat treatment exposed the crystal facets of Bi-22Y2 and facilitates on reconfiguration and eventually re-orientation of the Bi-22Y2 on the substrate axis. Superconducting property of the film was confirmed by the temperature dependence of its resistance. Figure 1.d. shows the resistance curve as a function of temperature for the representative Bi-22Y2 with $T_{c\text{-onset}}$ of 90 K, 93 K, 91 K, and 83 K for x = 0, 0.01, 0.02, 0.03, and 0.05, respectively. Partial substitution of yttrium on Bi-2212 films exhibits the expected increase in the superconducting critical temperature due to reduction of doping level. This property of the film is due to fact that the material transfer using infrared (1064 nm) Nd: YAG pulsed laser is block-by-block and not atomized.

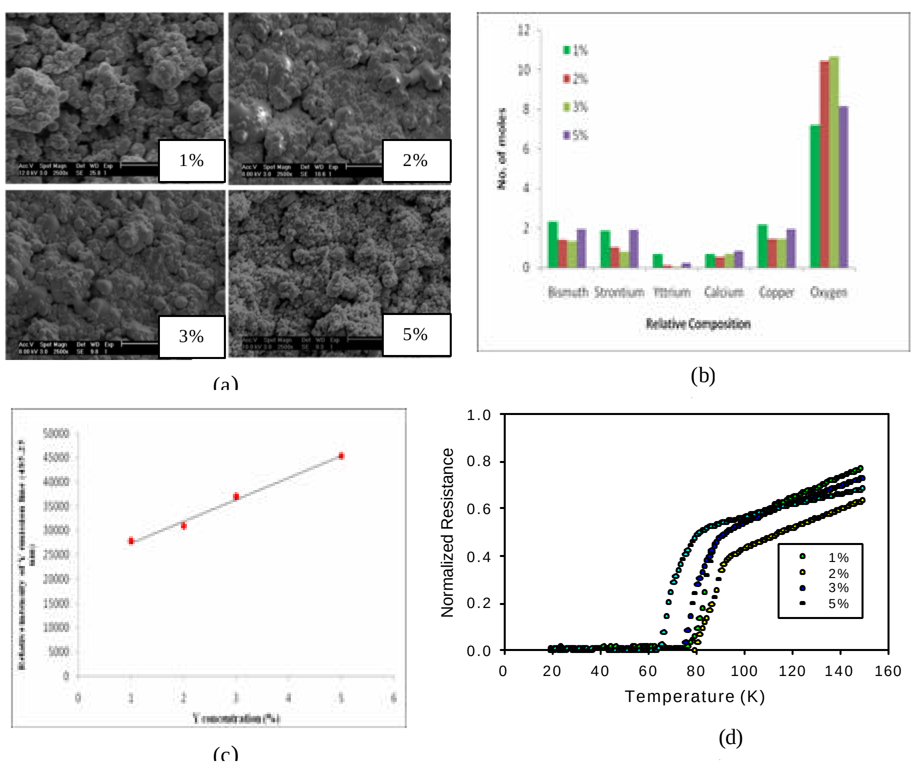

Figure 1: (a) SEM images of as-deposited y-doped films grown by infrared (1064 nm) Nd:YAG laser with post- deposition heat treatment, (b)EDX measurement of the as-deposited film; (c) Relative intensity of yttrium emission at 485.25 nm at varying doping concentration ; and (d) Superconducting transition temperature.

† on- leave from FEATI University, College of Arts, Sciences, and Education, Sta. Cruz Manila, Philippines