BS24

Comparative Study on Magentic and Electric Properties of $La_{0.7}Sr_{0.3}MnO_3/YBa_2Cu_3O_{7-\delta}$, $SrRuO_3/YBa_2Cu_3O_{7-\delta}$ and $LaNiO_3/YBa_2Cu_3O_{7-\delta}$ Bilayers

Sanghoon Ki, X. D. Zhang, Jian Li, and Joonghoe Dho*
Department of Physics, Kyungpook National University, Daegu 702-701, Korea
*Corresponding author: Joonghoe Dho, e-mail: jhdho@knu.ac.kr

Ferromagnetism(F) and superconductivity(S) seem to be incompatible because the former one requires a parallel spin alignment of electrons, while the latter prefers an antiparallel spin orientation of electrons in Cooper pairs. Until now, lots of research results on the injection of spin-polarized carriers from a ferromagnet to a superconductor and the proximity effects of these two compounds have been reported [1-5]. For example, the F-S bilayer systems such as $SrRuO_3$(SRO)/$YBa_2Cu_3O_{7-\delta}$ (YBCO) and $La_{0.7}Ca_{0.3}MnO_3$/YBCO have shown a slight decrease in the superconducting critical temperature(Tc) [3,5]. The interfacial phenomena are easy to be distorted by interface disorder like roughness, inter-diffusion, or interface alloying. Therefore, the F-S bilayer consisting of oxides only may be a good choice to study its interesting properties because both oxides can have the same structure, well-matching lattice parameters, and good chemical compatibility, which allows the growth of perfect interfaces.

Here, we have investigated the magnetic and electric properties of $La_{0.7}Sr_{0.3}MnO_3$(LSMO)/YBCO, SRO/YBCO, and $LaNiO_3$(LNO)/YBCO bilayers, where the YBCO layer was contacted with three different types of magnetic layers, such as a ferromagnetic(FM) half-metal LSMO, a FM normal metal, and a paramagnetic metal. Three different types of bilayer sysems were prepared by pulsed laser deposition method with the same depositon conditions. All three bilayers were epitaxially grown on the (100)$SrTiO_3$ substrate, but the crystallinity analysized by X-ray diffraction was slightly varied with the type of bilayers. We have measured the temperature dependences of magnetic and electric properties of LSMO/YBCO, SRO/YBCO, and LNO/YBCO. The superconducting critical temperature(T_C) of our bilayer samples was slightly lower than that of the single YBCO films. In addtion, we have examined the changes of resistivity and T_C with the external magnetic field and the applied current.

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BT01

Synthesis and Magnetorheological Characterization of Magnetite Nanoparticle and Poly(vinyl butyral) Composite

Bong Jun Park[1], Jae Lim You[1], Hyoung Jin Choi[1]*, Seong Yong Park[2], and Byoung Yoon Lee[2]
[1]Department of Polymer Science and Engineering, Inha University, Incheon 402-751, Korea
[2]Research Center, Chang Sung Co., Namdong Industrial Area, Incheon 405-100, Korea
*Corresponding author: Hyoung Jin Choi, e-mail: hjchoi@inha.ac.kr

Magnetorheological (MR) fluid is a stable colloidal suspension composed of soft magnetic particles dispersed in a viscous or viscoelastic non-magnetic carrier fluid [1]. They generally show rapid changes of rheological properties with external magnetic fields, and the suspension becomes a gel-like state under a magnetic field with enhanced both shear viscosity and viscoelastic characteristics.

Iron oxide nanoparticles, one of the well-known soft magnetic materials, have been widely investigated, because of their potential engineering applications. In order to use it as an MR fluid, the composite of poly(vinyl butyral) and magnetite nanoparticles was prepared via solvent evaporation method using synthesized magnetite nanoparticles. The composite materials have suitable size as well as low particle density suitable for the MR application. The magnetite nanoparticle was prepared via a co-precipitation method using both ferrous and ferric ionic aqueous solutions. The surface and internal morphology of the composite particles were observed via SEM and TEM. The MR fluid was prepared by suspending the composite particles in mineral oil, and then its MR characteristics were examined via a rotational rheometer in a parallel plate geometry equipped with a magnetic field supplier [2, 3]. MR properties of the composite based MR fluid were observed to exhibit typical MR behaviors with maximum yield stress of 800 Pa when 343 kA/m of magnetic field was applied.

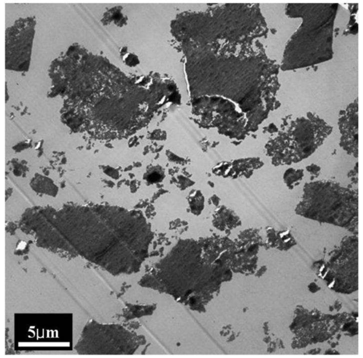

Fig. 1. TEM image of PVB/Magnetite composite particle.

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