Raman Spectroscopic Studies of $YBa_2Cu_3O_7$ Coated Conductors

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We present results of Raman spectroscopic studies of superconducting $YBa_2Cu_3O_7$ (YBCO) coated conductors. Thin films of YBCO were prepared on CeO_2/IBAD-YSZ coated metal tapes by a reel-to-reel pulsed laser deposition method. It is shown by x-ray diffraction that the as-grown YBCO films have a highly c-axis oriented and in-plane aligned texture. The critical current densities and the thicknesses of the YBCO layers are in the range of 0.2 ~ 1 MA/cm^2 and 0.7 ~ 1 μm, respectively. However, the microstructure and transport properties of the YBCO films obtained from the macroscopic tools are not enough to figure out the dimension-critical current density problems, which are now drawbacks for practical applications of the YBCO coated conductors. Raman scattering is used to characterize optical phonon modes, oxygen content, cation-disorder, and second phases of the YBCO coated conductors at a micron scale. Raman spectra of YBCO coated conductors of less transport quality often show extra peaks at ~600 cm^{-1}, ~630 cm^{-1}, ~690 cm^{-1} although they all show the apical oxygen mode at ~500 cm^{-1}, indicating nearly the same oxygen content. A two-dimensional mapping of Raman spectra with transport properties has been performed to elucidate the effect of local properties on current path and superconducting phase. The information taken from the local measurement will be useful for optimizing the process condition.

keywords : Raman spectroscopy, YBCO coated conductors, critical current density

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