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Universal values for the static and dynamic critical exponents in thin-film and bulk crystalline YBCO[1] C.J. LOBB, SU LI, HUA XU, Center for Nanophysics and Advanced Materials, Department of Physics, University of Maryland, College Park, M.C. SULLIVAN, Department of Physics, Ithaca College, Ithaca, NY, K. SEGAWA, YOICHI ANDO, ISIR, Osaka University, Ibaraki, Osaka, Japan, S.M. ANLAGE, Center for Nanophysics and Advanced Materials, Department of Physics, University of Maryland, College Park — Many researchers have used scaling of current vs. voltage curves to study the normal-superconducting phase transition of the high-temperature superconductors, searching for the static and dynamic critical exponents; however, there is little consensus among experimentalists as to the values of the exponents. We have studied this phase transition in optimally-doped $YBa_2Cu_3O_{7-\delta}$ thin films and bulk crystals. We consistently find $z = 1.5 \pm 0.2$ for the dynamic critical exponent in films (when finite-size effects are taken into consideration) and in crystals (where there are no finite size effects). We also find for the static critical exponent $\nu = 0.68 \pm 0.1$ for crystals and $\nu = 0.63 \pm 0.1$ for films. The failure to account for finite-thickness effects in thin films may account for the wide ranges of values for ν and z previously reported in the literature.

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