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Raman Investigation of Zn-Doped $YB_2Cu_3O_{6.99}$ Single Crystals

X. K. CHEN, J. C. IRWIN, Simon Fraser University, R. LIANG, D.A. BONN, W. N. HARDY, University of British Columbia, SFU TEAM, UBC COLLABORATION — We report the results of a Raman scattering study of the effects of doping $YBa_2Cu_3O_{6.99}$ crystals with 1.0% Zn, which decreased the critical temperature from 92K to 81K. We found that the strength and shape of the 340cm^{-1} B1g phonon anomaly are nearly the same in both the doped and undoped crystals. This observation suggests that Zn-doping does not significantly change the hole concentration. Furthermore, we extracted the B1g electronic continuum by removing the phonon contributions using a decoupling procedure. The resulting electronic spectra from the Zn- doped and undoped crystals are again essentially identical and are consistent with the scattering of light by the superconducting quasi-particles across a d-wave gap. The equal intensities of the B1g electronic continua again indicates that the carrier concentrations are the same in both the Zn-doped and undoped crystals. This in turn implies that Zn-doping does not lead to the opening of a pseudo gap.

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