

Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

T_c suppression and resistivity in cuprates with out-of-plane defects SIEGFRIED GRASER, Institut fuer Theoretische Physik, Universitaet Tuebingen, Tuebingen, Germany / Physics Department, University of Florida, Gainesville, FL 32611 USA, THOMAS DAHM, Institut fuer Theoretische Physik, Universitaet Tuebingen, Tuebingen, Germany, PETER J. HIRSCHFELD, LINGYIN ZHU, Physics Department, University of Florida, Gainesville, FL 32611 USA — The suppression of the critical temperature due to isotropic impurity scattering in a d -wave superconductor is expected to be described by the Abrikosov-Gor'kov formula. However recent experiments on cuprate superconductors with out-of-plane defects show a nearly linear decrease of the critical temperature as a function of the residual resistivity in contradiction to the Abrikosov-Gor'kov result. Other experiments suggest further that the T_c suppression is stronger for out-of-plane than for in-plane impurities. Both results can be explained assuming that elastic forward scattering is the dominant scattering process for out-of-plane disorder. We present a simple model of forward scattering allowing an analytical solution that already includes the key features of T_c suppression for out-of-plane defects. We also verify the intuitive result of this simple model by comparing it to numerical calculations assuming randomly distributed out- of-plane defects and a realistic band structure appropriate for YBCO.

Siegfried Graser
Institut fuer Theoretische Physik, Universitaet Tuebingen,
Tuebingen, Germany / Physics Department, University of Florida, Gainesville, FL 32611 USA

Date submitted: 25 Nov 2006

Electronic form version 1.4