

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Superconductivity induced by current injection into non-superconducting $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_8$ Y. SIMSEK, Y. KOVAL, X.Y. JIN, S. PROBST, P. MÜLLER, Department of Physics, Universität Erlangen-Nürnberg, Germany — The carrier-doping induced transition from the antiferromagnetic state to the superconducting phase is still one of the most fascinating properties of high-Tc materials. Usually hole doping is achieved by non-stoichiometry. However, we already have shown that we can change the carrier concentration of $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$ single crystals by current injection along the c-axis. This effect is persistent up to annealing temperatures of approximately 270 K. Now, the interesting question is if “chemical” doping by oxygen excess is necessary at all. For this purpose we performed current-injection experiments on fully oxygen depleted $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_8$ which was not superconducting above 4.2 K. In order to eliminate the contact resistance of the highly resistive depleted material, we realized a “true” 4-point geometry by fabricating double cross-bar crystal stacks. C-axis resistivity, critical current, and critical temperature were measured by c-axis transport. We have observed that by carrier injection the conductivity can be increased until superconductivity above 4.2 K is reached. Continuing the doping by current injection, optimum-doped and even overdoped states were obtained. Using current injection at higher bias, we were able to reduce the hole concentration again.

Y. Simsek
Department of Physics, Universität Erlangen-Nürnberg, Germany

Date submitted: 30 Nov 2010

Electronic form version 1.4