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Effects of He^+ ion irradiation on the two-band superconductivity of MgB_2 by point-contact spectroscopy WAN KYU PARK, BERND WILKEN, KAREN PARKINSON, LAURA GREENE, Department of Physics and Frederick Seitz Materials Research Laboratory, University of Illinois at Urbana-Champaign, Urbana, IL 61801, BRIAN MOECKLY, Superconductor Technologies Inc., Santa Barbara, CA 93111, JOHN ROWELL, Department of Chemical and Materials Engineering, Arizona State University, Tempe, AZ 85287 — An unresolved issue in MgB_2 is whether the two superconducting gaps can be merged into a single gap as T_c is reduced. It has been predicted that several effects, including enhanced interband scattering or a smeared density of states, can reduce T_c. Our transport measurements on MgB_2 thin films un-irradiated and irradiated with 1 MeV He^+ ions (doses: $1x10^{15}$ – $1x10^{17}$ ions/cm^2) show that ρ_{40K} increases and that T_c decreases roughly linearly with dose and ρ_{40K}, similar to other work [R. Gandikota *et al.*, cont-mat/0410655]. Point-contact spectroscopy on MgB_2 irradiated with $1x10^{16}$ ions/cm^2, with T_c reduced to 36.3 K from 39.3 K, shows that $2\Delta/k_BT_c$ increases from 1.43 to 1.76 (decreases from 4.13 to 3.90) for the smaller (larger) gap, so the gaps tend to merge. Detailed measurements and analyses based on the existing models [*e.g.*, J. M. Rowell, SST **16** R17 (2003), and J. Kortus *et al.*, cond-mat/0411667] will be presented. We acknowledge Pavel Krasnochtchekov and Robert Averback and support by the DoE DEFG02-91ER45439, through the FSMRL and the Center for Microanalysis of Materials.

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