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Effects of helium ion damage on the two-band superconductivity in MgB_2 thin films L.H. GREENE, W.K. PARK, X. LU, U. of Illinois at Urbana-Champaign, B. MOECKLY, Superconductor Technologies, Inc., R. SINGH, N. NEWMAN, J.M. ROWELL, Arizona State U. — While the two-band superconductivity in MgB_2 has been well established, it remains controversial whether disorder in the Mg and B planes causes enhanced interband scattering, band filling or both. To address this, we have performed electronic transport and point-contact spectroscopy measurements on helium-ion irradiated MgB_2 thin films. Two sets of samples are prepared using: a) 1 MeV He^+ ions with uniform doses ranging from $1x10^{15}$ to $1x10^{17}$ ions/cm^2; b) 2 MeV alpha particles with gradient doses. The resistivity (T_c) is observed to increase (decrease) monotonically with increasing dose. The conductance spectra are taken from point-contact junctions between MgB_2 thin films and Au tips. The T_c is determined by the onset of enhanced conductance at zero bias. Our preliminary results show that the two gaps tend to merge into one gap with increasing ion damage. Detailed results including T_c vs. energy gap will be presented and discussed in terms of the electronic structure change caused by ion-induced point defects. WKP acknowledges Pavel Krasnochtchekov and Robert Averback for ion irradiation experiments at UIUC. This work is supported by the DoE DEFG02-91ER45439, through the FSMRL and the Center for Microanalysis of Materials at UIUC.

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