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Effect of ion damage on the electrical properties of MgB2 RAGHURAM GANDIKOTA, RAKESH SINGH, JIHOON KIM, BARRY WILKENS, NATHAN NEWMAN, JOHN ROWELL, Arizona State University, ALEXEJ POGREBNYAKOV, XIAOXING XI, JOAN REDWING, SHENGYONG XU, QI LI, Pennsylvania State University, BRIAN MOECKLY, Superconductor Technologies Inc, ARIZONA STATE UNIVERSITY TEAM, PENNSYLVANIA STATE UNIVERSITY TEAM, SUPERCONDUCTOR TECHNOLOGIES INC. TEAM — The effect of point defects introduced by 2MeV alpha particles on Tc, resistivity and Hc2 of MgB2 films produced was studied. The damage controllably alters the material so the physical mechanisms that determine the widely varying electrical properties of the MgB2 samples and, in particular, the role of the 2 superconducting gaps can be investigated. The residual resistivity increases linearly by a factor of 50 as Tc decreases with damage to below 10K, while the change in resistivity from 300K to 40K decreases by less than 50%. Our results indicate damage increases the residual resistivity of the grains themselves, but has no significant effect on connectivity. These results, and the common resistivity at which Tc extrapolates to 0K, indicate a direct correlation between Tc and intra-grain resistivity. dHc/dT near Tc increases with damage, reaches a maximum for Tc of 30K and then decreases. Hc2 extrapolated to 0K are as high as 57T for fields perpendicular to c-axis.

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