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Reflection of two band properties in the magnetic penetration depth of ion irradiated MgB_2[1] S.D. KAUSHIK, S. PATNAIK, School of Physical Sciences, Jawaharlal Nehru University, New Delhi 110067 — Multiband superconductivity in MgB_2 has wide ranging ramifications for its transport characteristics. Using ion irradiation we have previously reported that by carefully choosing the type and density of defects, it is possible to control the inter and intra band scattering between the 2D σ and isotropic π bands of MgB_2. Here we report on the reflection of this defect induced modified scattering mechanism on the Meissner and mixed state penetration depth as a function of temperature, dc magnetic field, and defect density. The measurements are carried out using an ultrastable rf tunnel diode oscillator. The samples include unirradiated and those irradiated with 200 MeV Au^{15+} and 100 MeV Si^{8+}. The fits to the superfluid density over the entire temperature range give information about the evolution of two gaps with progressive dirtying. From the mixed state measurements the bulk pinning force constant and flux flow resistivity are estimated. We also compare the superconducting properties of MgB_2 with 2H-$NbSe_2$ (T_c = 7.3 K).

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