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Magnetic Field and Carbon-doping Dependent Far-infrared Studies of Epitaxial MgB_2 Films[1] JIUFENG TU, The City College of New York, G.L. CARR, QIANG LI, BNL, L. MYHALY, SUNY-Stony Brook, P. ORIGIANI, X.X. XI, Penn State — Magnetic field dependent (up to 10T) far-infrared transmission studies have been carried out for a series of pure and carbon- doped epitaxial MgB_2 films (between 30-40nm) on SiC substrates. While the carbon-doped film (30nm) exhibits the typical characteristics for a dirty BCS superconductor in the T_S /T_N ratio, the pure MgB_2 films show anomalous behavior: the peak in the T_S /T_N ratio is broad in frequency; and as the film thickness increases the peak height decreases. Both of these observations could be the direct results of multi-gap nature of the superconducting state in MgB_2. As a function of magnetic field, the pure MgB_2 films show saturation behavior beyond 8T which gives the value of H_{c2} at 8T for these films. Interestingly, the carbon- doped film also exhibits saturation behavior at around 8T, suggesting that the carbon impurities are not effective pinning centers for the vortex flux. Reflectivity measurements are underway to deduce the absolute scattering rates for both pure and carbon-doped films in order to construct an effective BCS model with multiple gaps based on the infrared data.

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