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Effect of scattering on the gap distribution in tunneling spectra of MgB_2/I/Pb junctions WENQING DAI, QI LI, Department of Physics, Pennsylvania State University, University Park, PA 16802, KE CHEN, XIAOXING XI, Department of Physics, Temple University, Philadelphia, PA 19122 — We fabricated MgB_2/Native oxide/Pb planar tunneling junctions using the MgB_2 films grown by the hybrid physical-chemical vapor deposition technique (HPCVD). Both π ($\sim$1.8 meV) and σ gaps ($\sim$7.9 meV) were observed in spectra due to tunneling from side of c-oriented MgB_2 grains on film surface on SiC (0001) substrates. We have previously observed a distribution of energy gap values within both bands in clean HPCVD films with long electron mean free path. Here we report an investigation of the tunneling spectra by systematically varying the MgB_2 film thickness and the thickness of native oxide barrier. We found the MgB_2 π gap distribution range narrows from $\sim$1.7 meV to $\sim$1.4 meV together with a loss of fine peak structures, as the MgB_2 film thickness decreases from 100 nm to 33 nm, in which the electron mean free path is limited by the thickness. In addition, fine peak structures also smear out when the junction resistance is large. The results show electron scattering from both inside the film and on the surface can smear out the gap distribution structures in tunneling spectra.

Wenqing Dai
Department of Physics, Pennsylvania State University,
University Park, PA 16802

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