

Abstract Submitted
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Sandwich-type MgB₂ tunnel junctions¹ KE CHEN, YI CUI, QI LI, XIAOXING XI², Department of Physics, The Pennsylvania State University, University Park, Pennsylvania, USA — Properties of superconductors, such as band gap, density of states (DOS) of quasiparticles, and effective phonon spectra, can be studied by electrical tunneling with a high energy resolution of several $k_B T$. Sandwich-type MgB₂ tunnel junctions with Pb or Ag as the counter-electrodes were made on Hybrid Physical-Chemical Vapor Deposition MgB₂ films with thermal oxide tunnel barrier. The tunnel junctions exhibit very small subgap current at 4.2 K. Fit to the BCS DOS relation, the π -band and σ -band gaps of MgB₂ are found to be 2.3 and 7.4 meV at 4.2 K respectively. Josephson tunneling was observed with $I_c R_n$ product following the BCS temperature dependence relation, and the critical current showing a Fraunhofer pattern modulated by the applied magnetic field. Effective phonon modes are revealed at 42, 61, and 74 meV. These superb tunnel junctions give us deep insights into the properties of MgB₂.

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²Also with Department of Materials Science and Engineering, The Pennsylvania State University, University Park, Pennsylvania, USA

Ke Chen
Department of Physics, The Pennsylvania State University,
University Park, Pennsylvania, USA

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