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All MgB_2 tunnel junction with Al_2O_3 tunnel barrier[1] HEEJAE SHIM, JAGADEESH S. MOODERA, Francis Bitter Magnet Laboratory, MIT, Cambridge, MA — MgB_2 tunnel junctions are attractive not only from superconducting electronics application part of view but also from the fundamental physics to understand multi-gap superconductors. All MgB_2 planar junctions with Al_2O_3 tunnel barrier were fabricated in situ in an MBE system by coevaporation of Mg and B for MgB_2 and plasma oxidized Al for tunnel barrier on Si (111) substrate. The junctions exhibit the current-voltage characteristic for quasiparticle and Josephson tunneling including microwave induced Shapiro steps. From conductance spectrum at 1 K, we clearly observe features that correspond to different π and σ superconducting energy gaps for the two MgB_2 electrodes. The observed multi-gap structure will be discussed with the difference of crystallographic orientation of MgB_2 at the interface between tunnel barrier and both superconducting layers.

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