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MgB2 Tunnel Junctions with Native or Thermal Oxide Barriers RAKESH SINGH, Arizona State University, RAGHURAM GANDIKOTA, JIHHON KIM, NATHAN NEWMAN, JOHN ROWELL — MgB_2 tunnel junctions (MgB_2/barrier/MgB_2) were fabricated using an oxide (or a mixture of oxides) grown on the first MgB_2 film as the tunnel barrier, by exposure to air at 20^oC (native oxide) or 160^oC (thermal oxide). Such barriers therefore survived the deposition of the second electrode at 300^oC, even over junction areas of $\sim 1mm^2$. The sum of the superconducting gaps of the top and bottom electrodes, from conductance-voltage data, was as high as 4.3 mV and this sum gap remained non-zero for temperatures above 30 K. Conductance vs. voltage dependencies of all-MgB_2 junctions and those of the type MgB_2/Native or Thermal Oxide/Metal (Pb, Au, or Ag) were used to characterize the height and width of the barriers formed. Such barriers have surprisingly low barrier heights, with typical values for barrier height and width being 0.2 V and 4.5 nm respectively. These values are very different from those reported in the literature. These results show that tunnel barriers grown on MgB_2 can have different properties (barrier height and width), depending on the film growth, surface composition and oxidation conditions.

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