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Evidence for the Potential Barrier Height Reduction in Metal-Oxide-Metal Tunnel Junctions due to the Interface Dependent Metal-Induced-Gap-States LEE HOSIK, NEC, HYUNTAE JUNG, YONGMIN KIM, KYOOHO JUNG, HYUNSIK IM, Dongguk University, YURI PASHKIN, O. ASTAFIEV, J. S. TSAI, NEC Nano Electronics Research Laboratories and RIKEN Advanced Science Institute, YOSHIYUKI MIYAMOTO, NEC, NEC TEAM, DONGGUK UNIVERSITY TEAM, NEC NANO ELECTRONICS RESEARCH LABORATORIES AND RIKEN ADVANCED SCIENCE INSTITUTE TEAM — We have performed transport measurements on Al and Nb based metal-oxide-metal tunnel junctions with an AlO_x tunnel barrier and found a strong dependence of the effective potential barrier height on the oxide-metal interface properties. Our estimations of the barrier height based on a phenomenological Simmons' model are consistent with the values obtained from the first-principle calculations. The calculations clearly show that the barrier height is strongly affected by the formation of metal induced gap states originating from the hybridization between metallic bands and Al_2O_3 conduction band. These findings are important for nanoelectronic devices containing tunnel junctions with a thin insulating layer.

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