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Band alignments and electron transport in metal/epi-Sc_2O_3/Si (111) structures studied by BEEM and Internal Photoemission W. CAI, S.E. STONE, J.P. PELZ, Ohio State Univ., L.F. EDGE, D.G. SCHLOM, Pennsylvania State Univ. — Recently, Internal Photemission (Int-PE) has been used to study band alignments between Si and amorphous rare-earth/transition metal oxide films, of interest as possible high dielectric gate insulators for future MOS electronic devices [1,2]. Surprisingly, a variety of these oxide films were found to have nearly the same band alignments and band gap, and also "tailing" conduction band (CB) states extending ∼1 eV below the primary CB. We have applied Ballistic Electron Emission Microscopy (BEEM) and Int-PE to 20 nm-thick epitaxial Sc_2O_3 film grown at 700 ^{o}C on Si(111), to study electron transport through these "tail" states and to estimate oxide fixed charge. These tail states are found to form a "robust" CB that supports elastic electron transport even against an applied electric field, with a ∼1.1 eV CB offset at the Si interface. Al/epi-Sc_2O_3/Si structures were ∼1000 times leakier than those made with Pt, consistent with the lower electron tunneling barrier expected for the lower work function Al. The measured dependence of the BEEM threshold voltage on metal bias suggests ∼0.2 C/cm^3 fixed negative oxide charge with a 250 ^{o}C anneal before Pt deposition and no post-metallization anneal. Work supported by SRC. [1] V. V. Afanas'ev *et al.*, Appl. Phys. Lett. **85**, 5917 (2004). [2] V. V. Afanas'ev *et al.*, Appl. Phys. Lett. **88**, 032104 (2006).

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