Abstract Submitted
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Temperature- and time-dependence of hot-electron injection and accumulation in vertical Si nanowires studied with nm-resolution ballistic electron emission microscopy J.P. PELZ, W. CAI, Y. CHE, The Ohio State Univ., E.R. HEMESATH, L.J. LAUHON, Northwestern Univ. — Semiconducting nanowires (NWs) are of great interest for new devices, but the influence of quantum and geometry-related size effects on NW carrier injection and transport must be better understood. We report ballistic electron emission microscopy (BEEM) measurements of hot-electron injection into individual "end-on" metal Schottky contacts to vertical Si-NWs at 80-300K. We observe increasing *suppression* of BEEM current with increasing hot-electron flux compared to a regular Au/Si junction, which we propose to be due to a *steady-state (SS) charge accumulation* in the NW that increases with the amplitude of injected current. The suppression varies greatly for different NWs (suggesting an extrinsic defect-related mechanism) and increases strongly at lower temperature, likely due to increased SS charge accumulation. Dynamic charge trapping or de-trapping behavior (with time scale in the range of 50 to 200 ms) is observed when the tunnel current is abruptly changed, supporting that the suppression is due to (temperature-dependent) SS charge accumulation. Electrostatic simulations of carrier trapping at the Si/SiO_2 interface at NW walls [1] are consistent with the observed suppression. Work supported by NSF Grant No. DMR-0805237.

[1] Y. Cui *et al.*, Nano Lett. **3**, 149 (2003).

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