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Charge Injection and Relaxation in HfO_2 Films Measured by Single Electron Tunneling Force Spectroscopy[1] CLAYTON WILLIAMS, DUSTIN WINSLOW, JON JOHNSON, Department of Physics, University of Utah — Detection and imaging of individual trap states in dielectric materials with atomic scale spatial resolution has been recently demonstrated.[2] Spectroscopic measurements on HfO_2 films by Single Electron Tunneling Force Spectroscopy have now shown evidence of both reversible and irreversible tunneling to and from these electronic trap states. The irreversibility is small near the middle of the band gap, becoming larger at ~ 0.7 eV below the conduction band and 1.3 eV above the valence band. The irreversibilty of tunneling is likely due to charge relaxation. The evidence of charge relaxation in the film and a description of this new nanometer scale spectroscopic capability will be presented. The possible mechanisms by which the relaxation takes place will also be described.

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[2]J.P. Johnson et al, Nanotechnology **20** (2009) 055701.

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