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Creation of Electron Trap States in Silicon Dioxide By Local Electron Injection[1] DUSTIN WINSLOW, CLAYTON WILLIAMS, University of Utah — Over a decade ago, the Scanning Tunneling Microscope was shown capable of desorbing single hydrogen atoms from the surface of hydrogen terminated silicon.[2] The resultant dangling bonds can act as atomic scale quantum dots.[3] Electrons trapped in such dangling bond states at the surface of crystalline silicon have short retention times at room temperature, due to the proximity of the occupied state energy level to the conduction band. Here we report on a method for creating electron trap states at the surface of a silicon dioxide film by electron injection from a metalized Atomic Force Microscope probe tip. Single Electron Tunneling Force measurements[4] are employed to examine the existence of trap states in the silicon dioxide surface before and after the electron injection. Evidence for electron trap state creation, without topographic modification of the silicon dioxide surface, will be presented. The trap states created by this process have electron retention times which are greater than one second at room temperature. The methodology for trap state creation and detection will be presented.

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[2]T.C. Shen et. al. Science 268, 1590 (1995).
[3]M. B Haider et. al. PRL 102, 046805 (2009).
[4]E. Bussmann, et. al. Appl. Phys. Lett., 85, 13 (2004).

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