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Single electron tunneling measurements of Titanium Silicide islands on Si(100) J.L. TEDESCO, J.E. ROWE, North Carolina State University, R.J. NEMANICH, Arizona State University — Titanium silicide ($TiSi_2$) islands have been formed by the ultrahigh vacuum (UHV) deposition of thin films of titanium ($<$ 1 nm) on clean Si(100) surfaces followed by annealing to $\sim$800^{o}C. Scanning tunneling microscopy (STM) and scanning tunneling spectroscopy (STS) have been performed on these islands to demonstrate single electron tunneling (SET). Evidence of Coulomb staircase peaks corresponding to SET has been identified in current-voltage (I-V) curves recorded from islands at room temperature. Predictions of the orthodox model were found to agree with our data, except for slight discrepancies of the shape of the I-V curves at current steps. Many islands that were expected to exhibit SET did not do so. Potential reasons for the absence of SET include Schottky barrier lowering due to Fermi level pinning, and interfacial faceting which was identified as the most likely reason for the absence of observable SET. The positive SET results establish that a Schottky barrier can be used as an effective tunnel junction in a future double barrier tunnel junction (DBTJ) device. Possible approaches to improve the reliability based on control and engineering of surface and interface electronic bands will be discussed.

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