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Tunneling Spectroscopy of Ultrathin Insulating Films: Cu_2N on Cu(100)[1] CHARLES RUGGIERO, TAEYOUNG CHOI, JAY GUPTA, The Ohio State University — Insulating films of only a few atomic layers offer insight into the evolution of electronic structure at the nanoscale. We report scanning tunneling microscopy (STM) studies of one monolayer Cu_2N films grown on Cu(100). Our tunneling spectra indicate that Cu_2N acts as an insulator, with a band gap that exceeds 4 eV [1]. We study changes in this electronic structure with size, ranging from few-atom islands to complete films. We find that the conduction band edge first emerges in few-atom islands, and shifts toward lower energy with increasing island size. Images of the local density of states show standing wave patterns consistent with the confinement of electrons to these 2D islands. Measurements of the tunneling barrier height and image potential states indicate that the Cu_2N work function is $\sim$0.9 eV larger than bare Cu. This suggests a significant surface dipole, consistent with charge transfer predicted by theory. http://www.physics.ohio-state.edu/$\sim$jgupta

[1] C.D. Ruggiero, T. Choi, J.A. Gupta, Appl. Phys. Lett. **91**, 253106 (2007).

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