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(G*) The charge characterization of atomic wires on hydrogen passivated silicon

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With current CMOS technologies approaching their performance limits, nanoscale atomic electronics are poised to provide the next-generation of devices and a continuation of Moore's law. Several promising beyond-CMOS platforms, such as dangling bond (DB) circuitry on hydrogen-passivated silicon require precise knowledge of the location of charges within fabricated atomic structures. To achieve this in the past, atomic force microscopy (AFM) measurements have been used to determine the charge population of dangling bonds structures, though these measurements are often cumbersome. Here, we employ a quicker, minimally-perturbative scanning tunneling microscope charge sensing scheme to measure the charge of atomic dangling bond wires and compare the results with AFM data. Two DB wires were sequentially lengthened to form a continuous wire near a sensor DB. IV spectroscopy over the sensor reveals spectral shifts which correspond to the addition of nearby charge with single electron sensitivity. The results show a reduction of charge when the wires are joined and agree with standard AFM based techniques which predict dangling bond wires to be ionic chains.

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