TIME AND CROSS-CORRELATION HISTOGRAMS IN CONDUCTANCE MEASUREMENTS OF NANOWIRES FORMED AT SEMICONDUCTOR INTERFACES

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9.7 cm

We demonstrate experimentally that conductance steps can occur in nanowires formed at metal-semiconductor junction due to quantum effects such as conductance quantization and a single-atom contact formation. Electronic properties of the interface result from the band structures of the materials that form the contact leading to a Schottky barrier rising at the metal-semiconductor interface. Conductance traces obtained from measurements in nanowires formed between a cobalt tip and a germanium surface reveal long-duration plateaus at reproducible levels. We detect strongly nonlinear current-voltage characteristics typical for systems with a Schottky barrier. The high reproducibility of the conductance traces obtained from short series of measurements leads to very sharp peaks in the classical conductance histogram suggesting formation of stable atomic configurations. To analyze these highly reproducible data we develop a new type of time- and cross-correlation analysis of the preferred conductance values depicted in the form of the 2D density plots that provide new type of information on a few-atomic-nanocontact formation dynamics.

13.4 cm

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