Abstract Submitted
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Analysis and fabrication of micro scale self-terminated electrochemical growth by a pressure-driven method[1] FATEMEH SOLTANI, ALEX WLASENKO, GEOFF STEEVES — A self-terminated electrochemical method was used to fabricate microscopic-scale contacts between two Au electrodes in a microfluidic channel. The conductance of contacts varies in a stepwise fashion with a tendency to quantize near the integer multiples of the conductance quantum (G_0). The mechanism works by a pressure-driven flow parallel with a pair of Au electrodes with a gap in order of micron in an electrolyte of HCl. When applying a bias voltage between electrodes, metal atoms are etched off the anode and deposited onto the cathode. Consequently, the gap decreases to the atomic scale and then completely closed as the two electrodes form a contact. The electrochemical fabrication approach introduces large variance in the formation and location of individual junctions. Controlling this process will enable the precise positioning of reproducible geometries into nano-electronic devices. To investigate the high speed behavior of a QPC, it can be integrated with a transmission line structure patterned on a photoconductive GaAs substrate. The nonlinear conductance of the QPC (due to the finite density of states of the conductors) can be examined and compared with recent theoretical studies. Samples are fabricated in situ using an electrochemical procedure to produce QPCs along the transmission line structure. This method may provide insight into Terahertz Optoelectronic devices and ultrafast communication systems.

[1]NSERC

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