

## Single Atom Manipulation with 4 Scanning Tunneling Microscope Technique

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**Abstract :** Nanoelectronics, for example the calculating circuits integrating at molecule scale logic gates, atomic scale circuits, has been constructed and investigated recently. A major challenge is their functional properties characterization because of the connecting problem from atomic scale to micrometer scale. New experimental instruments and new processes have been proposed therefore. To satisfy a precisely measurement at atomic scale and then connecting micrometer scale electrical integration controller, the technique improvement is kept on going. Our new machine, a low temperature high vacuum four scanning tunneling microscope, as a customer required instrument constructed by Omicron GmbH, is expected to be scaling down to atomic scale characterization. Here, we will present our first testified results about the performance of this new instrument. The sample we selected is Au(111) surface. The measurements have been taken at 4.2 K. The atomic resolution surface structure was observed with each of four scanners with noise level better than 3 pm. With a tip-sample distance calibration by I-z spectra, the sample conductance has been derived from its atomic locally I-V spectra. Furthermore, the surface conductance measurement has been performed using two methods, (1) by landing two STM tips on the surface with sample floating; and (2) by sample floating and one of the landed tips turned to be grounding. In addition, single atom manipulation has been achieved with a modified tip design, which is comparable to a conventional LT-STM.

**Keywords :** low temperature ultra-high vacuum four scanning tunneling microscope, nanoelectronics, point contact, single atom manipulation, tunneling resistance

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