Electrical conduction through surface superstructures measured by microscopic four-point probes - DTU Orbit (17/10/2019)

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For in-situ measurements of the local electrical conductivity of well-defined crystal surfaces in ultra-high vacuum, we have developed two kinds of microscopic four-point probe methods. One involves a “four-tip STM prober,” in which four independently driven tips of a scanning tunneling microscope (STM) are used for measurements of four-point probe conductivity. The probe spacing can be changed from 500 nm to 1 mm. The other method involves monolithic micro-four-point probes, fabricated on silicon chips, whose probe spacing is fixed around several mum. These probes are installed in scanning-electron-microscopy/electron-diffraction chambers, in which the structures of sample surfaces and probe positions are observed in situ. The probes can be positioned precisely on aimed areas on the sample with the aid of piezoelectric actuators. By the use of these machines, the surface sensitivity in conductivity measurements has been greatly enhanced compared with the macroscopic four-point probe method. Then the conduction through the topmost atomic layers (surface-state conductivity) and the influence of atomic steps on conductivity can be directly measured.

General information
Publication status: Published
Organisations: Nanointegration, Department of Micro- and Nanotechnology
Pages: 963-980
Publication date: 2003
Peer-reviewed: Yes

Publication information
Journal: Surface Review and Letters
Volume: 10
Issue number: 6
ISSN (Print): 0218-625X
Ratings:
Scopus rating (2003): SJR 0.535 SNIP 0.393
Web of Science (2003): Indexed yes
Original language: English
DOIs: 10.1142/S0218625X03005736
Source: orbit
Source ID: 193661
Research output: Contribution to journal › Journal article – Annual report year: 2003 › Research › peer-review