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New electronic effects observed on n-type Si(111)2x1 using cross-sectional STM NEIL J. CURSON, PHILIPP STUDER, STEVEN R. SCHOFIELD, GREG LEVER, DAVID R. BOWLER, CYRUS HIRJIBEHEDIN, UCL, UK — Cross-sectional scanning tunneling microscopy (XSTM) of in-situ cleaved semiconductor surfaces has two distinct advantages over STM experiments where studies are performed on the surface of the annealed and/or sputtered semiconductor wafers. Firstly, the cleaving process exposes a clean surface without the usual need for high temperature annealing, thus revealing a surface that has not been driven to its thermodynamic minimum energy state. Secondly, the surface being imaged is perpendicular to the surface of the original wafer, which is of particular value for the study of implanted or epitaxially overgrown wafers. We use XSTM measurements, spatially resolved scanning tunneling spectroscopy (STS) and density functional theory (DFT) to study the electronic properties of the cleaved (111)2x1 surface of silicon. We examine bulk-doped, and ion-implanted samples. Our studies reveal new, long range, electronic effects that have implications for future nanoscale devices in silicon.

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