Abstract Submitted
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Investigating individual arsenic dopant atoms in silicon using low-temperature scanning tunnelling microscopy[1] NEIL CURSON, KITIPHAT SINTHIPTHARAKOON, STEVEN SCHOFIELD, PHILIPP STUDER, VERONIKA BRAZDOVA, CYRUS HIRJIBEHEDIN, DAVID BOWLER, London Center Nanotechnology, UCL, 17-19 Gordon Street, London, WC1H 0AH, UK — We study sub-surface arsenic dopants in a hydrogen terminated Si(001) sample at 77 K, using STM and STS. We observe a number of different dopant related features that fall into two classes, which we call As1 and As2. The As1 features are consistent with buried dopants that are in the electrically neutral (D0) charge state when imaged in filled states, but become positively charged (D+) through electrostatic ionisation when imaged under empty state conditions. DFT calculations predict that As dopants in the third layer of the sample induce two states lying just below the conduction band edge, which hybridize with the surface structure creating features with the surface symmetry consistent with our STM images. The appearance of the As2 features surprisingly suggests they are negatively charged at all biases.

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