Atomically Precise Placement of Single Dopants in Si

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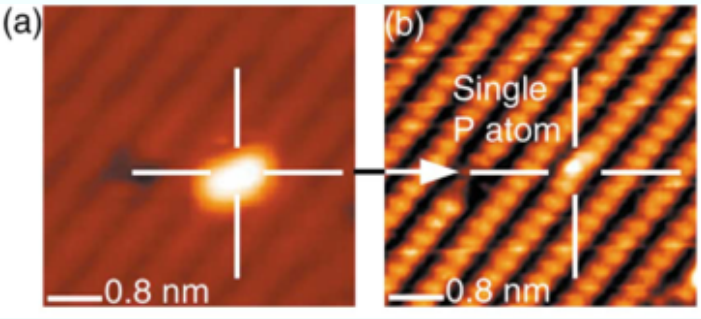

STM images of atomically controlled single P atom incorporation into Si(001).

We demonstrate the controlled incorporation of P dopant atoms in Si(001), presenting a new path toward the creation of atomic-scale electronic devices.We present a detailed study of the interaction of PH3 with Si(001) and show that it is possible to thermally incorporate P atoms into Si(001) below the H-desorption temperature. Control over the precise spatial location at which P atoms are incorporated was achieved using STM H lithography. We demonstrate the positioning of single P atoms in Si with ~1 accuracy and the creation of nanometer wide lines of incorporated P atoms.

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