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Adsorption of H atoms at Si(111)4x1-In surface

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We studied the adsorption of H atoms at a Si(111)4×1-In surface at room temperature using scanning tunneling microscopy (STM) measurements and *ab-initio* calculations. The H atom is found to preferentially adsorb at a bridge site between an In atom of the outer In chain and a Si atom of a neighboring Si chain. The adsorbed H atom induces not only a lattice distortion but also an electronic perturbation near the Fermi level, which appears as out-of-phase, period-doubling (×2) charge orderings in the filled- and the empty-states STM images. The ×2 perturbed region remains metallic, distinguishing it from the insulating low-temperature 4×2(8×2)-In phase. We found that the observed ×2 perturbation away from the H-adsorbate is a H-stabilized, theoretical ground state of the In/Si(111) surface predicted by density-functional theory.