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On the Si(111)5×2-Au surface, Si adatom diffusion is defect-mediated EZRA BUSSMANN, Sandia Natl Labs, NM, S. BOCKENHAUER, F.J. HIMPSEL, U.W.-Madison, B.S. SWARTZENTRUBER, Sandia Natl Labs, NM — The Si(111)5×2-Au surface is a member of a family of metal-induced chain reconstructions of Si. Studies of these reconstructions have led to new understanding of the physics of one-dimensional electronic states. The 5×2-Au surface is speckled with Si adatoms, which are intimately linked with the surface electronic properties. At temperatures > 423 K, the adatoms diffuse along the chains between adjacent 5×2 cells. We have measured scanning tunneling microscopy movies of the diffusing adatoms. Distinctive diffusion statistics, e. g. correlations between displacements, imply that the displacements are triggered by an interaction with a defect. By a statistical characterization of the diffusion, we show that the adatoms move by a defect-mediated mechanism similar to the vacancy-mediated diffusion observed on some metal surfaces. We use a Monte Carlo simulation to model the diffusion process, accurately reproducing the unique diffusion statistics over the temperature range $(145 - 215^o\mathrm{C})$ of our experiments. We have also determined the diffusion activation barrier$=1.24 \pm 0.08$ eV. Sandia National Labs is operated by Sandia Corp, a Lockheed-Martin Company, for the DOE under Contract No. DE-AC04-94AL85000. FJH and SB acknowledge NSF support under DMR-0705145.

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