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Pattern formation of hydrogen adatom density on Cu(111) using patterns of xenon adatoms as templates.[1] XIANGDONG ZHU, YIYAN FEI, University of California at Davis — We formed grating-like patterns of hydrogen adatom density on Cu(111) by using complementary patterns of xenon adatom density as the template. The template was pre-formed by laser-induced thermal desorption of a Xe monolayer on Cu(111) using the interference pattern of two coherent laser pulses. The "patterned" surface was subsequently exposed to hot hydrogen molecules which dissociate and adsorb preferentially on the uncovered part of the surface. We removed the Xe template by laser-induced thermal desorption which left behind a grating-like hydrogen density pattern intact on Cu(111). By following the evolution of hydrogen density gratings on Cu(111) from 153 to 183 K with linear optical diffraction, we found that the diffusion of hydrogen atoms on Cu(111) in this temperature range was characterized by an activation energy barrier E_{diff} = 6.4 kcal/mol (or 279 meV) and a pre-exponential factor $D_0 = 2.0 \times 10^{-3}$ cm^2/sec.

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