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The Impact of CO-CO Interactions on the Diffusive Behavior of CO/Cu(111) LUDWIG BARTELS, University of California Riverside, KIN WONG, BOMMISETTY V. RAO, KI-YOUNG KWON, ERICK ULIN-AVILA, GREG PAWIN — We investigated the diffusion of CO on Cu(111) and, in particular, the impact of local coverage and nearest neighbor separation on the diffusion probability and direction. Measurement of the diffusivity of isolated CO molecules over the temperature range between 30 and 40K permits us to determine a diffusion barrier of 75 +/- 5meV at a prefactor of $5.3*10^7$ Hz. An increase of the local coverage of CO can increase its diffusion probability significantly, e.g. the presence of 7 CO molecules within an 8 Cu-Cu-distance radius of a CO molecule increases the CO diffusivity by a factor of ca. 3. Experiments addressing pairs of CO molecules show that at close proximity the dominant diffusion direction is orthogonal to the intermolecular vector. At larger intermolecular distance, the diffusion direction becomes significantly more isotropic. Statistical analysis of the distribution of CO pairs reveals that intermolecular distances of n+ $^1/_2$ periods (n=0,1, ...) of the substrate surface state oscillation are favorable. The absence of island formation at low coverage is surprising to us and suggests that the intermolecular attraction cannot balance the entropy gain associated with a disordered coverage.

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