Erratum: Quantitative description of C₆₀ diffusion on an insulating surface **[Phys. Rev. B 82, 155428 (2010)]**

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We report an error in the calculation of the island densities per adsorption site $\hat{N}$ in the original paper. The original values were mistakenly calculated as $\hat{N} = N/\Omega$ with N as the measured island density and $\Omega = 0.129 \text{ nm}^2$ as the area of an adsorption site [area of a CaF₂(111) lattice site]. The corrected values are now calculated as $\hat{N} = \Omega N$. The corrected version of Fig. 4 of the original paper is given below.

Although the diffusion barrier E_d remains unchanged, the attempt frequency is now shifted to

$$\nu_0 = 3.2 \times 10^{17 \pm 0.6} \text{ s}^{-1},$$

outside the range of previously observed attempt frequencies for large molecules (10^{10} – 10^{14} s^{-1}). Hence, it is appropriate to provide some additional discussion.

One possible systematic error is the value of Ω , which appears in the calculation of $\hat{N}$ from experimental island densities and in Eq. (1) of the original paper,

$$\hat{N} = 0.25 \left(\frac{\Omega^2 F}{D} \right)^{i^*/i^*+2} \exp \left(\frac{1}{i^*+2} \frac{E_{i^*}}{k_B T_S} \right). \quad (1)$$

In the derivation of Eq. (1) (see Ref. [1]), it is implicitly assumed that an adsorbate molecule covers one adsorption site, which is not the case in this system (one C₆₀ covers multiple adsorption sites). Although we are not discussing how this might change the result of the derivation, another reasonable choice for Ω might be the area that is effectively occupied by an adsorbate molecule (in this case, $\Omega_{\text{C}_{60}(111)} = 0.866 \text{ nm}^2$), which changes the result of the analysis by almost an order of magnitude to $\nu_0 = 4.8 \times 10^{16 \pm 0.6} \text{ s}^{-1}$.

Another possible reason for the large value of ν_0 is that the diffusion process may not be composed of jumps between CaF₂(111) sites (jump length of $l = 386 \text{ pm}$) but rather by jumps between impurities on the CaF₂ substrate or simply by jumps across multiple lattice sites, which would correspond to a larger effective jump length. The parameters l and ν_0 both enter the equations via the diffusion coefficient,

$$D = \frac{1}{4} l^2 \nu_0 \exp \left(-\frac{E_d}{k_B T_S} \right),$$

FIG. 4. Upon decreasing substrate temperature T_S , the island density $\hat{N}$ increases and is assumed to follow Eq. (1). The slope reveals the diffusion barrier to $E_d = (214 \pm 16) \text{ meV}$.

where the jump length l is assumed to be known. Without this assumption, we can, instead, make a statement about the product,

$$l^2 \nu_0 = 4.8 \times 10^{-2 \pm 0.6} \text{ m}^2/\text{s}$$

(calculated with $\Omega = 0.129 \text{ nm}^2$). We note that the attempt frequency moves into the range of previously observed values for effective jump lengths $l \gtrsim 10 \text{ nm}$. To shed more light upon the dynamics of the diffusion process, we are planning to independently measure the attempt frequency in a future experiment at lower temperatures.

[1] T. Michely and J. Krug, *Islands, Mounds and Atoms* (Springer, Berlin, Heidelberg, 2004).