Erratum: Lattice gas study of thin-film growth scenarios and transitions between them: Role of substrate [Phys. Rev. E 103, 023302 (2021)]

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In this paper we argued that the use of relatively low values for both Γ and ϵ_0 gives information for higher Γ, ϵ_0 by invoking a scaling argument for island densities in submonolayer growth. Decreasing the value of Γ leads to identical island densities (and, we conjecture, multilayer morphology) if the value of ϵ_0 is also decreased accordingly.

In Eq. (2) of the paper, we used a familiar relation from rate equation theory where the island density depends on the scaling variable $\Gamma^{i^*/(i^*+2)} \exp[-|E_{i^*}|/(i^*+2)]$, and we used $i^* = 1$ (stable dimers) and set E_{i^*} to the value of nearest-neighbor interaction ϵ_0 (all energies are in units of the thermal energy). However, E_{i^*} is the bonding energy in the *largest unstable* island. For stable dimers, E_{i^*} is thus 0 and not ϵ_0, making the island density independent of ϵ_0.

Stable dimers correspond to $\epsilon_0 \to \infty$, and for finite ϵ_0 it is not quite clear what the size of the first stable island is. Here, we find approximative scaling by analyzing the submonolayer island data from kinetic Monte Carlo simulations provided in the Supplemental Material of Ref. [1]. The parameters E_D (diffusion barrier) and E_B (bonding energy) are converted to Γ and ϵ_0 through

$$|\epsilon_0| = \frac{E_B}{k_B T}, \quad \Gamma = \frac{\frac{2k_B T}{h} \exp\left(-\frac{E_D}{k_B T}\right)}{0.0167\frac{1}{s}}. \tag{1}$$

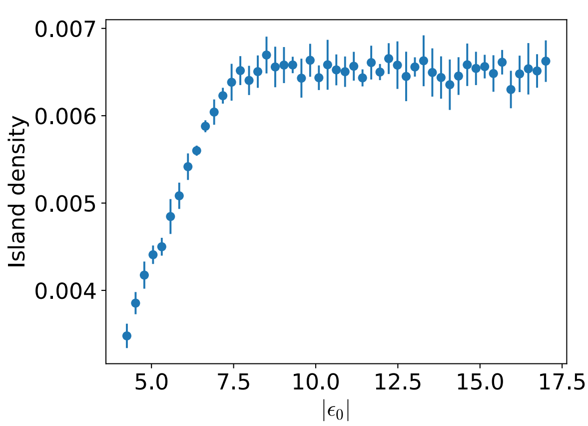

FIG. 1. Island density vs $|\epsilon_0|$ for $\Gamma \approx 4.78 \times 10^4$ ($E_D = 0.55$ eV). For $|\epsilon_0| \gtrsim 8$, the island density is independent of ϵ_0, indicating that in this region $i^* = 1$.

In Fig. 1 we show the dependence of the density of islands (of size 2 and larger) on ϵ_0 for constant Γ (or E_D). We find an initial substantial increase in the island density, followed by a flattening at large binding energies. This is the crossover from the region in which dimers are unstable to that in which they are stable and where subsequently the island density does not depend on ϵ_0. Thus we show that, for smaller values of ϵ_0, the island density *does* depend on ϵ_0.

In Fig. 2 we show the island density plotted vs a scaling variable $\zeta = \Gamma^n(c + e^{-\epsilon_0})$ and $n = 1.5$, $c = e^{-8}$ in a log-log plot. Colors denote the magnitude of ϵ_0, varying from $\epsilon_0 \approx 4.25$ (purple) to $\epsilon_0 \approx 9$ (yellow). From this plot we infer that for $\epsilon_0 \lesssim 9$, scaling works very well for $n = 1.5$. Our investigated values of ϵ_0 and Γ in the paper are well within this scaling region.

Based on these findings we are confident that scaling holds for a substantial range of ϵ_0 and Γ, although our original argument was misguided.

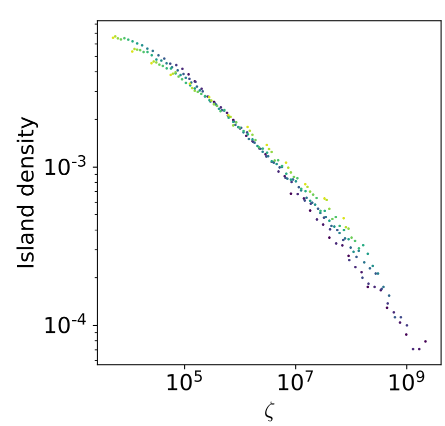

FIG. 2. Island density vs ζ for $n = 1.5$, $c = \exp(-8)$ for values of $\epsilon_0 \leqslant 9$. Colors denote the strength of ϵ_0, going from purple (weak) to yellow (strong).

[1] T. Martynec, C. Karapanagiotis, S. H. L. Klapp, and S. Kowarik, Commun. Mater. **2**, 90 (2021).

