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 $\Gamma$ and $\epsilon_0$ gives information for higher $\Gamma$, $\epsilon_0$ by invoking a scaling argument for island densities in submonolayer growth. Decreasing the value of $\Gamma$ leads to identical island densities (and, we conjecture, multilayer morphology) if the value of $\epsilon_0$ 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 $\Gamma^{\epsilon_0/2} \exp[-|E_i^*|/(\epsilon_0 + 2)]$, and we used $i^* = 1$ (stable dimers) and set $E_i^*$ to the value of nearest-neighbor interaction $\epsilon_0$ (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 $\epsilon_0$, making the island density independent of $\epsilon_0$.

Stable dimers correspond to $\epsilon_0 \rightarrow \infty$, and for finite $\epsilon_0$ 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 $\Gamma$ and $\epsilon_0$ through

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

In Fig. 1 we show the dependence of the density of islands (of size 2 and larger) on $\epsilon_0$ for constant $\Gamma$ (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 $\epsilon_0$. Thus we show that, for smaller values of $\epsilon_0$, the island density does depend on $\epsilon_0$.

In Fig. 2 we show the island density plotted vs a scaling variable $\zeta = \Gamma^{\epsilon_0/(c + e^{-}\epsilon_0)}$ and $n = 1.5$, $c = e^{-8}$ in a log-log plot. Colors denote the magnitude of $\epsilon_0$, 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 $\epsilon_0$ and $\Gamma$ in the paper are well within this scaling region.

Based on these findings we are confident that scaling holds for a substantial range of $\epsilon_0$ and $\Gamma$, although our original argument was misguided.