

# Supplementary Information for “Initial pseudo-steady state & asymptotic KPZ universality in semiconductor on polymer deposition”

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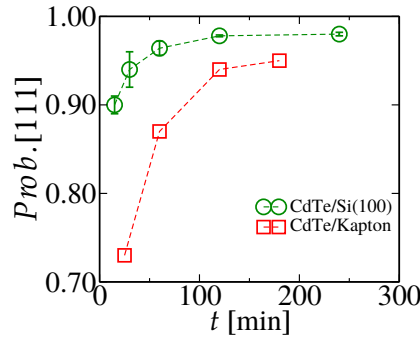
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## 1 X-Ray diffraction measurements

We used a D8-Discover (BRUKER) X-Ray diffractometer (XRD) in the  $\theta - 2\theta$  coupled mode (radiation  $\lambda_{CuK\alpha} = 0.15418$  nm) for studying CdTe crystalline structure as deposition proceeds. From the XRD spectra (not shown), we calculated the probability of finding grains in the [111] direction, relative to all other allowed directions, as:

$$P([111], t) = \frac{I_{111}(t)/A_{\theta-2\theta}(\theta_{111})}{\sum_{hkl} I_{hkl}(t)/A_{\theta-2\theta}(\theta_{hkl})} \quad (1)$$

where  $I_{hkl}$  is the intensity of the peak  $hkl$ , and  $A_{\theta-2\theta}(\theta_{hkl})$  is the absorption factor for the  $\theta - 2\theta$  geometry, dependent on  $\theta_{hkl}$  angle<sup>1</sup>. Figure S1 shows the temporal evolution of probabilities  $P([111], t)$  for both CdTe grown on Kapton and on Si(001) substrates at same conditions. On both substrates, there is an increasing of  $P([111], t)$  with  $t$ , which indicates the existence of a preferential growth (i.e. a texture) in [111] direction. However, the curves are rather different for short deposition times, with  $P([111], t)$  significantly smaller for Kapton substrates. In short, (111)-grains take longer time to dominate the film structure in the Kapton case, probably due to the non-crystalline nature of the polymer. As discussed in the main text, this difference is the key to explain the existence of the pseudo-steady state (PSS) regime for Kapton.

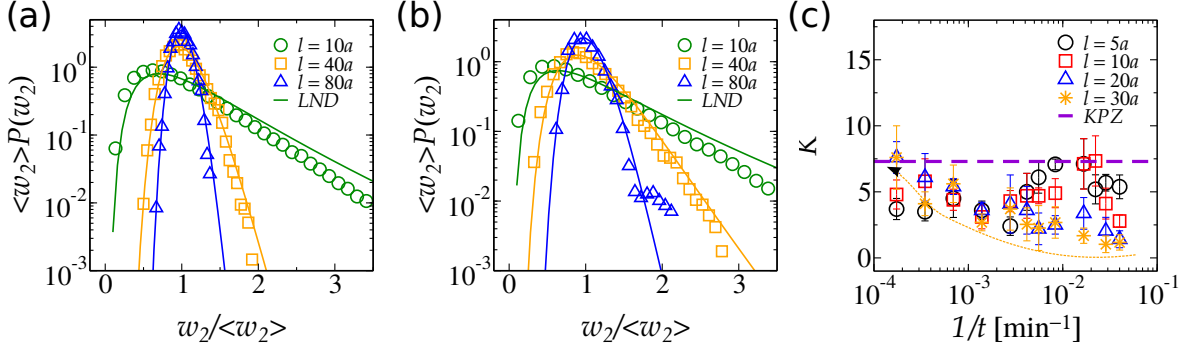


**Suppl. Fig. 1.** Probability of finding a CdTe grain in the [111] direction as a function of time. Data for CdTe/Si(100) is the same reported in<sup>2</sup>.

## 2 Additional data for width and extremal height distributions

In Fig. 2(d) of the main text we compare width distributions (rescaled to zero mean and unitary variance) with the log-normal distribution (LND). A more complete analysis can be done by comparing distributions rescaled to unitary mean  $P(x)$ , with  $x \equiv \frac{w_2}{\langle w_2 \rangle}$ , which are expected<sup>3</sup> to be given by the LND:

$$P(x, t) = \frac{1}{\sqrt{2\pi}\sigma x} \exp \left\{ -\frac{[\ln(x) - \mu]^2}{2\sigma^2} \right\}, \quad (2)$$

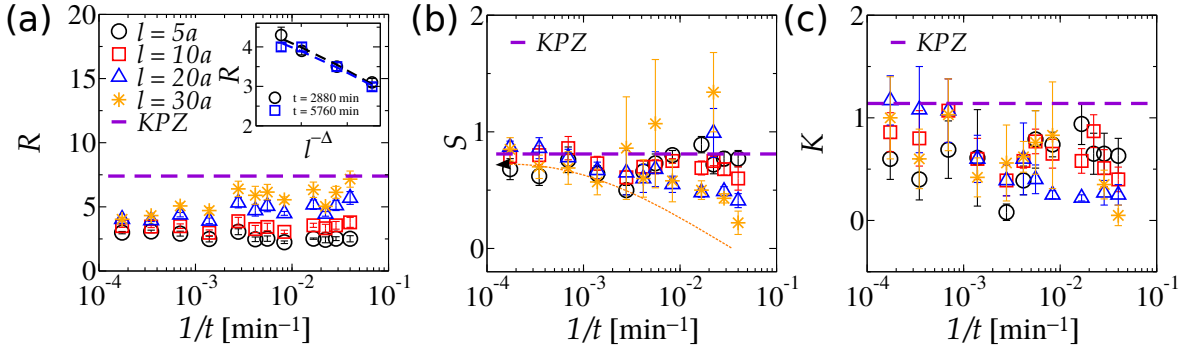


**Suppl. Fig. 2.** Rescaled width distributions  $P(w_2)$  (symbols) for CdTe surfaces for (a)  $t = 120$  min (PSS regime) and (b)  $t = 720$  min (KPZ regime). Solid lines are LNDs with the respective (experimentally calculated) parameters  $\mu$  and  $\sigma$ . (c) Kurtosis ( $K$ ) of  $P(w_2)$  as a function of  $1/t$  for several window sizes.

when the correlation length  $\xi$  is much smaller than the window size  $l$  ( $\xi \ll l$ ). In the equation above,  $\mu(t) \equiv \langle \ln(x) \rangle$  and  $\sigma(t) \equiv \sqrt{\langle \ln^2(x) \rangle - \langle \ln(x) \rangle^2}$ . We rescaled distributions in such way, for fixed times in PSS and KPZ regimes and different  $l$ 's [see Figs. S2(a) and S2(b)]. Indeed, in both regimes we observe a nice agreement between the width distributions and their respective LNDs (with  $\mu$  and  $\sigma$  obtained directly from the experimental data). As expected, as larger  $l$  is, narrower the distributions are, since they are converging to a delta function. Moreover, in the limit of small  $l$  the collapses worsen, since the condition  $\xi \ll l$  is obviously not satisfied.

The convergence of the kurtosis  $K$  for the stationary width distribution (for  $\xi \gg l$ ) is presented in Fig. S2(c). Similarly to the cumulant ratios  $R$  and  $S$  (shown in Figs. 4(a) and 4(b) of the main text, respectively), we observe that  $K$  converges to the KPZ value as  $t$  and  $l$  becomes large (with  $\xi \gg l$ ).

Figure S3 shows cumulant ratios for (local) maximal height distributions  $P(m)$  calculated in the stationary regime ( $\xi \gg l$ ). The skewness is in striking agreement with the value expected<sup>3</sup> for KPZ class, presenting small time- and  $l$ -corrections. Values of  $K$  for large  $t$  and  $l$  also agree quite well with the KPZ one. On the other hand, the ratio  $R \equiv \langle m \rangle_c / \langle m^2 \rangle_c^{1/2}$  is still rather different from the KPZ value, even for large  $t$  and  $l$ . One way for dealing with this slow convergence is to take the  $R$  values for the longest times and extrapolate them for  $l \rightarrow \infty$ . Performing such procedure [see the inset of Fig. S3(a)], we find  $R = 7.3(5)$ , which is basically the same  $R$  value obtained from simulations of KPZ models<sup>3</sup>.



**Suppl. Fig. 3.** Cumulant ratios (a)  $R$ , (b) skewness  $S$  and (c) kurtosis  $K$  for maximal height distributions as functions of  $1/t$ , for several window sizes ( $l \ll \xi$ ). The inset in (b) shows a extrapolation of  $R$  as  $l^{-\Delta}$  goes to zero, where  $\Delta = 0.17$  is used to linearize the data.

## References

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3. Carrasco, I. S. S. & Oliveira, T. J. Width and extremal height distributions of fluctuating interfaces with window boundary conditions. *Phys. Rev. E* **93**, 012801 (2016).