SUBMONOLAYER ISLAND GROWTH OF ORGANICS: CAPTURE-ZONE DISTRIBUTIONS, GROWTH EXPONENTS, & TRANSIENT MOBILITY*

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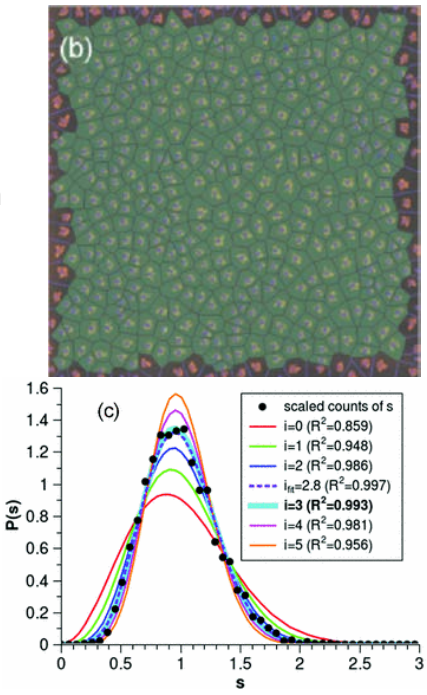

b) Voronoi tessellation for islands of 6P on sputtered mica; c) analysis of distribution $P(s)$ of s, cell areas [÷ average area] using GWD [2]

Analyzing capture-zone distributions (CZD) using the generalized Wigner distribution (GWD) has proved a powerful way to gain insight into epitaxial growth, in particular to access the critical nucleus size i, as reviewed in [1]. The CZ of an island contains all points closer to that island than to any other, a generalization of Wigner-Seitz cells known as a Voronoi tessellation. This approach complements measurements of the growth exponent α from the scaling (with flux F) of island density $N \propto F^{\alpha}$ and of the distribution of island sizes. We summarize some extensive Monte Carlo simulations and especially experiments on various systems to which the GWD has been applied, emphasizing organic adsorbates. Others include atomic (sometimes with impurities), quantum dots, and colloidal nano-particles. In the case of parahexaphenyl (6P) on sputter-modified mica [2], the value i extracted from CZD (see figures) differs from the [larger] values of i deduced from $N \propto F^{\alpha}$. Furthermore, the values of i differed considerably at small and large F, which was attributed to DLA and ALA dynamics [2]. To reconcile the CZD and scaling measurements, we took into account long-known transient mobility (hot precursors) [3]. Similar behavior is seen for pentacene adsorbates. We close with applications of the GWD to social phenomena, notably the areas of Voronoi tessellations of subway stations and of secondary administrative units (e.g. French arrondissements and German Landkreise) [4]. In some other cases (e.g. Dutch gemeenten and Turkish ilçeler) a lognormal distribution accounts better for the data. We discuss the source and note analogous behavior in surface phenomena.

Keywords: Deposition of organic molecules, growth on surfaces, size distributions

References

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