

Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Vapor-Fluid Chemical Deposition: the effects of fluid solubility on sub-monolayer growth kinetics RYAN NEFF, CHARLES MORAN, DAVID PATRICK, BRAD JOHNSON, Western Washington University — It is well known that sub-monolayer growth kinetics may be described by scaling laws. In particular, the distribution of the sizes of clusters coalescing under driven diffusive aggregation will scale with cluster size, a result that has been demonstrated by numerical simulation and verified by experiment (under vacuum deposition conditions). We study a system wherein monomers are dropped on a fluid surface with a given flux rate, allowed to diffuse and aggregate through a 3-D fluid volume, and deposit on a 2D substrate bounding the fluid in the vertical direction. We find 3 regimes with different deposition outcomes: i) the solubility of the monomers in the fluid is low, in which case aggregates form a “crust” near the top fluid surface, ii) the solubility is high and the monomers “stick” to the substrate (a minimum surface energy) but retain the activated diffusion appropriate to the fluid, and iii) the same, except that the monomers/aggregates undergo standard 2-D DDA once they reach the substrate. We find that the scaling laws do not apply to the case ii), where there is no peak in the size distribution, but are regained for the case iii). These results agree with preliminary data modeling deposition of tetracene under fluid-interface conditions.

Brad Johnson
Western Washington University

Date submitted: 22 Dec 2009

Electronic form version 1.4