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Submonolayer Pentacene Thin Film Growth on Hydrogen-Passivated Si(111) substrate WEIJIE HUANG, BOQUAN LI, JIAN-MIN ZUO, Department of Materials Science and Engineering, University of Illinois at Urbana-Champaign — Exploding interests to implement organic semiconductors in novel electronic and optical applications urge the growth of organic thin film with large single crystalline grain and structural homogeneity. By tailoring growing parameters, such as incident flux, substrate surface chemistry and substrate temperature, we succeeded growing pentacene monolayer on a hydrogen-passivated Si(111) substrate, with average grain diameter of 15 micron, by low flux Organic Molecular Beam Deposition(OMBD). We observe that, using atomic force microscope, the morphology of the islands evolve from independent fractal shapes to correlated compact shapes, as the coverage increases, which can be explained by capture-zone growth model. Dynamic scaling behavior of the 2 dimensional pentacene islands is studied, from which critical island size for nucleation on H-Si(111) surface is extracted. Pentacene's large island size and layer-by-layer growth mode on H-Si(111) allow us to study fundamental processes of metal deposition on pentacene, which include metal-carbon bonding formation, crystal structure of the metal cluster on pentacene layers, and the pentacene-step-mediated growth of metal clusters.

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