Introduction

Similar to other organic materials, pentacene has a growing tendency to form weakly bound crystallites. In the early stages of the 3D island growth process. This could be an effect of the lower density of reactive sites on the organic substrates yielding higher diffusion constants. In the atomic force images of Fig. 5 the influence of a reduction of the deposition rate is demonstrated by atomic force microscopy. The 1.4 nm thick film is comprised of density and well-ordered 3D islands exhibiting a high quality. The island height varies over the film from being less than 1 nm to more than 20 nm. The size distribution of the islands is highly consistent with the observation of optical microscopy for films grown directly on glass substrates. The ratio of the maximum grain size to the film thickness of 50 nm thick pentacene thin films is 1.4 nm.

Thin Film Formation and Substrate Material

In Fig. 2, the atomic force microscopy images demonstrate the effect of the deposition rate on the film morphology. The 1.4 nm thick film is comprised of density and well-ordered 3D islands exhibiting a high quality. The island height varies over the film from being less than 1 nm to more than 20 nm. The size distribution of the islands is highly consistent with the observation of optical microscopy for films grown directly on glass substrates. The ratio of the maximum grain size to the film thickness of 50 nm thick pentacene thin films is 1.4 nm. The influence of the drain voltage is also illustrated.

Substrate Temperature and Pentacene Polymorphs

An increase of the substrate temperature during the condensation process causes the 3D island growth process. This could be an effect of the lower density of reactive sites on the organic substrates yielding higher diffusion constants. The deposition rate at the initial stages of the nucleation process that determines the grain density. For a control of the growth process, it is inevitable to precisely adjust the deposition rate.

Deposition Rate

In the atomic force images of Fig. 5, the influence of the deposition rate on the film morphology is demonstrated by atomic force microscopy. The 1.4 nm thick film is comprised of density and well-ordered 3D islands exhibiting a high quality. The island height varies over the film from being less than 1 nm to more than 20 nm. The size distribution of the islands is highly consistent with the observation of optical microscopy for films grown directly on glass substrates. The ratio of the maximum grain size to the film thickness of 50 nm thick pentacene thin films is 1.4 nm. The influence of the drain voltage is also illustrated.

Electrical Characterization

All investigated film transistors are characterized in the common-gate configuration with source and drain on top. The electrets are made by thermal evaporation of GaF through a gold top contact. The 2D islands are used as "molecular electronics" of the films from an assembly of epitaxial layers of pentacene. From the grain density and the maximum grain size, it is possible to predict the 3D island growth process. This could be an effect of the lower density of reactive sites on the organic substrates yielding higher diffusion constants. The deposition rate at the initial stages of the nucleation process that determines the grain density. For a control of the growth process, it is inevitable to precisely adjust the deposition rate.


Thin Film Transistors with SiO 2 and PVP as Dielectric. The gold top contacts were deposited at rates of 0.05 nm/s and 1 nm/s.

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Structural, Morphological and Electrical Properties of Pentacene Based Thin Film Transistors

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