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Kinetics-driven growth mechanism of self-organized pentacene thin films ABDULLAH AL-MAHBOOB, JERZY T. SADOWSKI, YASUNORI FUJIKAWA, KAZUO NAKAJIMA, TOSHIO SAKURAI, Institute for Materials Research, Tohoku University, Sendai, Japan — The growth kinetics of self-organized, highly ordered (001)-oriented pentacene (Pn) thin films was studied in situ by low-energy electron microscopy (LEEM) and complementary density functional theory calculations. We propose a model of 'molecule incorporation-controlled' growth mechanism, according to which the attachment pathway at the island edge and the attachment energy of crystallization unit, rather than step or surface energies, determine the island shape in the kinetic growth of organic molecular thin film. We have found that experimentally observed growth anisotropy can be reproduced exactly by our model, if molecule attachment at island-edge is realized in the form of herringbone pair, for all low-indexed growth directions of Pn thin film. The observed kinetic anisotropy also results in a preference in Pn domain orientations, which tend to have the $<01>^*$ direction of the surface lattice aligned with the direction of the gradient density of supplied molecular flux.

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