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Conducting AFM and 2D GIXD Studies on Pentacene Thin Films HOICHANG YANG, CHANG Y. RYU, Rensselaer Polytechnic Institute, TAE JOO SHIN, Brookhaven National Laboratory, KILWON CHO, POSTECH, Korea, MANG-MANG LING, ZHENAN BAO, Stanford University — 2D GIXD, TM-, and C-AFM analyses of pentacene films support the idea that the morphology of ultrathin layers plays a crucial role in determining mobility in OTFT. While 60-nm-thick pentacene films exhibited similar terrace-like multilayer structure with the long axis of pentacene perpendicularly oriented as determined from TM-AFM and 2D GIXD, its charge mobility in an OTFT was quite different, depending on the types of hydrophobic SAM surface treatment. This difference is related to the morphological difference of the first pentacene layer "buried" under the terrace-like multilayers. We found that the faceted islands on HMDS showed larger current flow than the dendritic islands on OTS using C- AFM. This trend in C-AFM current images correlated well with the charge carrier mobility measured in OTFTs. Such faceted morphology represents single crystal-like pentacene islands, which have fewer internal crystal defects and higher current flow than the dendritic islands.

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