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Nanoscale domains in thin-film pentacene seen by mid-infrared near-field spectroscopy FRITZ KEILMANN, BERT NICKEL, CHRISTIAN WESTERMEIER, CLEMENS LIEWALD, Ludwig-Maximilians-Universitaet Muenchen, SERGIU AMARIE, ADRIAN CERNESCU, Neaspec GmbH Martinsried — The coexistence of structural phases in thin-film pentacene was known from X-ray diffraction, yet the scale of domain sizes remained unknown due to large-scale averaging. Infrared spectroscopy (classical FTIR) can distinguish different structural phases by slightly shifted molecular vibrational resonances but with spatial resolution not better than about 10 micrometer. When FTIR is paired with near-field microscopy performed by back-scattering infrared radiation from an AFM tip ("nano-FTIR" allowing 20 nm resolution), Bulk-Phase (BP) domains were readily observed to form <100 to 300 nm wide ellipsoids which significantly grow over months at atmospheric conditions, at the cost of the surrounding Thin-Film-Phase (TFP) pentacene. Both the domain interfaces and their continuing dimensional evolution may point to hidden problems for solar conversion systems development, possibly also with molecular materials beyond pentacene. C. Westermeier, A. Cernescu, S. Amarie, C. Liewald, F. Keilmann, and B. Nickel, *Sub-micron phase coexistence in small-molecule organic thin films revealed by infrared nano-imaging*, Nature Communications 5, 4101, DOI:10.1038/ncomms5101 (2014)

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