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Time Resolved Microscopy of Charge Trapping in Polycrystalline Pentacene MICHAEL JAQUITH, Cornell University, ERIK MULLER[1], Brookhaven Natl. Labs, JOHN MAROHN, Cornell University — The microscopic mechanisms by which charges trap in organic electronic materials are poorly understood. Muller and Marohn recently showed that electric force microscopy (EFM) can be used to image trapped charge in working pentacene thin-film transistors [E. M. Muller *et al.*, *Adv. Mater.* **17** 1410 (2005)]. We have made a new discovery by imaging trapped charge in pentacene films with much larger grains. In contrast to the previous study in which charge was found to trap inhomogeneously throughout the transistor gap, we find microscopic evidence for a new trapping mechanism in which charges trap predominantly at the pentacene/metal interface in large-grained devices. We conclude that at least two charge trapping mechanisms are at play in polycrystalline pentacene. We have made localized measurements of the trap growth over time by performing pulsed-gate EFM experiments. Trap formation is not instantaneous, taking up to a second to complete. Furthermore, the charge-trapping rate depends strongly on gate voltage (or hole concentration). This kinetics data is consistent with the hypothesis that traps form by chemical reaction.

[1]Previously at Cornell University

Michael Jaquith
Cornell University

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