

Abstract Submitted
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The improvement of out of plane crystalline size of pentacene thin films on plastic substrates by transfer printing¹ S.A. SOLIN, Y. SHAO, Washington University in St. Louis, D.R. HINES, E.D. WILLIAMS, University of Maryland — Pentacene thin films on plastic substrates were fabricated using the transfer printing method. [1] The out of plane structural order, structure disorder factor and crystalline size were studied by X-ray diffraction.[2] The effects of transfer printing control parameters, such as temperature and pressure, on the crystalline size and structural disorder were quantified using paracrystal theory. The calculated average number of reflecting net planes in the crystalline domains N and the disorder factor g_{II} agree with the α^* law. The 12~16% improvement of out of plane crystalline size was observed for pentacene printed at 100 -120 °C. Higher printing pressure 600 PSI improved the crystallinity above that obtained with low pressure 100 PSI. Pentacene printed at 120 °C and 600 PSI showed both optimal growth axis crystalline size of 283 Å and mobility 0.237 cm²/Vs, respectively. The optimized crystalline size shows a direct correlation with the improvement of the carrier mobility of pentacene thin film transistors. [1] D. R. Hines *et al.*, Appl. Phys. Lett. 86, 163101 (2005). [2] Y. Shao *et al.*, J. Appl. Phys. 100, 44512 (2006).

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Yue Shao
Washington University in St. Louis

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