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Field-induced low temperature transport in polythiophene thin films EVAN KANG, EUNSEONG KIM, KAIST — Low temperature charge transport in poly(2,5-bis(3-tetradecylthiophen-2-yl)thieno[3,2-b]thiophene) (PBTTT) field-effect transistors (FETs) was systematically investigated. The temperature dependent transport behavior was studied by varying drain-source electric field and gate bias. Thermally-assisted hopping is dominant at high temperatures. At low temperatures, the temperature dependence becomes weaker and tunneling becomes the prevailing transport mechanism. Under high drain-source electric field, the additional field-driven current leads to the non-ohmic current-voltage relations. The results will be discussed with previously suggested models, such as Poole-Frenkel-type hopping [1], Efros-Shklovskii hopping [2], multistep tunneling [3], and field emission [1, 4]. [1] J. H. Worne, J. E. Anthony, and D. Natelson, Appl. Phys. Lett. 96, 053308 (2010) [2] A. S. Dhoot, G. M. Wang, D. Moses, and A. J. Heeger, Phys. Lev. Lett. 96, 246403 (2006) [3] J. H. Wei, Y. L. Gao, and X. R. Wang, Appl. Phys. Lett. 94, 073301 (2009) [4] J. M. Beebe, B. Kim, J. W. Gadzuk, C. D. Frisbie, and J. G. Kushmerick, Phys. Rev. Lett. 97, 026801 (2006)

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