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Polarization-induced transport in TIPS-pentacene field-effect transistors[1] AMRIT LAUDARI, SUCHI GUHA, University of Missouri, Columbia — The dielectric constant of polymer ferroelectric dielectrics can be tuned by changing the temperature, offering a platform for monitoring the changes in interfacial transport in organic field-effect transistors (FETs), as the polarization strength is tuned. Temperature dependent transport studies of FETs have been carried out from a solution-processed organic semiconductor, 6,13-bis(triisopropylsilylethynyl)pentacene (TIPS-pentacene), using both ferroelectric and non-ferroelectric gate insulators. Non-polar dielectric based TIPS-pentacene FETs show a clear activated transport in contrast to the ferroelectric dielectric polymer, poly(vinylidene fluoride-trifluoroethylene) (PVDF-TrFE), where a negative temperature coefficient of the mobility is observed in the ferroelectric temperature range. We attribute the weak temperature-dependence of the charge carrier mobility to a polarization fluctuation driven transport resulting from a coupling of the charge carriers to the surface phonons of the polar dielectric. The negative coefficient of mobility ($\frac{d\mu}{dT} < 0$) observed with ferroelectric dielectrics is not a signature of an extended-state conduction but rather denotes polarization fluctuation driven transport.

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