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Temperature-dependent electrical transport in ferroelectric organic field-effect transistors[1] AMRIT LAUDARI, SUCHISMITA GUHA, Univ of Missouri - Columbia — Ferroelectric dielectrics, permitting access to nearly an order of magnitude range of polarization with temperature as the tuning parameter, offer a great test-bed to monitor the changes in interfacial transport in organic field-effect transistors (OFETs) as the polarization strength is tuned. Temperature-dependent transport studies have been carried out from pentacene and other organic semiconductor-based OFETs using the ferroelectric copolymer poly(vinylidene fluoride-co-trifluoroethylene) (PVDF-TrFe) as a gate insulating layer. By fits to an Arrhenius-type dependence of the charge carrier mobility as a function of temperature, the activation energy in the ferroelectric phase is found to increase as the thickness of the PVDF-TrFe layer increases. For thicknesses of the dielectric layer above 100 nm, the activation energy is found to be greater than 150 meV, which greatly reduces in the paraelectric phase of the dielectric. The weak temperature-dependence of the charge carrier mobility in the ferroelectric phase of PVDF-TrFe may be attributed to a polarization fluctuation driven transport. The threshold voltage decreases upon increasing temperatures with a large change above the ferroelectric to paraelectric phase transition temperature.

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