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A crystalline organic semiconductor grown from a mesophase: A test of polaron band theory NARESH SHAKYA, CHANDRA POKHREL, Department of Physics, Kent State University, BRETT ELLMAN, SHIN-WOONG KANG, SATYAN KUMAR, Department of Physics, Kent State University, YULIA GETMANENKO, ROBERT TWIEG, Department of Chemistry, Kent State University — We find that the hole mobility of the crystal smectic phases of the liquid crystal 1,4-di-(5-n- tridecylthien-2-yl)-benzene increases exponentially with decreasing temperature. While qualita- tively consistent with transport via polaron bands, we find that it is quantitatively difficult to explain the data with physically realistic parameters. In particular, the data demand either quite large typical optical phonon frequencies and/or phonon bandwidths. We also find evidence that an unusually highly ordered high temperature smectic-F phase templates the formation of crystalline smectic phases, which may have implications for device development.

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