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Dielectric relaxation in semiconducting regioregular poly(3-hexylthiophene)[1] TATIANA PSUREK, JAN OBRZUT, Polymers Division, National Institute of Standards and Technology — Regioregular effect transistor applications. While, the electrical mobility properties of P3HT have been examinedthe dielectric poly(3-hexylthiophene) (P3HT) is a material typically used as an organic semiconductor in thin film field- relaxation processes have not been systematically studied. We investigated the dielectric response of P3HT films in the temperature range of 240 K to 315 K and at frequencies up to 12 GHz. In the low frequency range P3HT shows a semi-conducting character and the overall dielectric response is dominated by dc-conductivity with $E_a = 17$ kJ/mol. The apparent semi-conducting character cease at certain frequency above which, the material becomes a dielectric. At room temperature the semi-conducting to dielectric transition takes place at about 5 kHz. In the range of 10 kHz to 12 GHz the dielectric dispersion is insignificant and the dielectric constant is about 4. The dielectric relaxation process, with $\tau = 3{*}10^{-5}$s and $E_a = 24$ kJ/mol, can be attributed to local molecular motion of thiophene rings.

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