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Role of defect states in charge transport in semiconductor nanowires[1] DONGKYUN KO, XIANWEI ZHAO, KONGARA REDDY, WOLFGANG WINDL, NITIN PADTURE, NANDINI TRIVEDI, FENGYUAN YANG, EZEKIEL JOHNSTON-HALPERIN — Charge transport characteristics are investigated in Se-doped InP nanowires in order to determine the nature of the defect states. I-V curves indicate that transport is limited by trapped space charges rather than by Schottky at high bias. In addition, mobility calculations show that hopping between defect states plays an important role at low bias. A transition between hopping mechanisms as a function of temperature can be determined from the behavior of the temperature-dependent resistance R(T). Nearest neighbor hopping (NNH) is dominant in the high temperature regime (>158K) , $R \sim exp(T_0/T)^{1.03}$, and Efros-Shklovskii variable range hopping (ES-VRH) is dominant in the low temperature regime (<158K), $R \sim exp(T_{ES}/T)^{0.49}$. Gate-bias dependence of the transition temperature and hopping parameters are also investigated: these results suggest that applying positive gate-bias changes the strength of electron correlations in these quasi-1D systems.

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