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Gate-induced Fermi level tuning and ambipolar conduction control in InP nanowires KRISTIAN STORM, GUSTAV NYLUND, MAGNUS BORGSTRÖM, JESPER WALLENTIN, CARINA FASTH, CLAES THELANDER, LARS SAMUELSON, Lund University — Semiconducting nanowires are an interesting platform for studies of fundamental material transport properties in one dimension as well as for building blocks for various types of devices. Most conventional semiconductor devices are based upon doping for its operation, but as device dimensions are decreased, the random position of a few incorporated impurity atoms may come to dominate device characteristics. We present measurements of InP nanowires in which the Fermi level is tuned at efficiency close to the theoretical limit using semi-wrapped gates. Furthermore, we present ambipolar devices in which the Fermi level can be tuned across the entire bandgap of the semiconductor. We believe this will be of considerable importance and serve as a foundation for producing nanowire devices where the device behavior is induced by sequential gates wrapped around the nanowire channel, replacing the need for doping in certain types of devices. This way, the properties can be dynamically tuned using wrapgates, as opposed to statically set using the doping level.

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