

Abstract Submitted
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Electronic properties of doped semiconductor nanowires MA-MADOU DIARRA, CHRISTOPHE DELERUE, IEMN-ISEN, YANN-MICHEL NIQUET, CEA/DRFMC/SP2M/LSim, GUY ALLAN, IEMN-ISEN — Semiconductor nanowires have shown very promising properties, which opens new opportunities for the design of nanoscale devices. The physics of these nanowires is not yet fully understood. In this context, theory and numerical simulation give valuable insights. We present self-consistent tight binding calculations of donor and acceptor impurities in semiconductor nanowires, either in a free standing configuration or surrounded by a metallic gate and an oxide. We show that the dielectric mismatch between the nanowires and their surroundings increases the binding energies of dopant impurities up to a few hundreds of meV [1]. This decreases the doping efficiency and affect the behavior of nanowire devices. The effect of the environment will be discussed. When the nanowires are surrounded by an oxide, polaronic effects largely contribute to the binding energy of the dopants [2].

[1] M. Diarra, Y. M. Niquet, C. Delerue and G. Allan, Phys. Rev. B 75, 045301 (2007).

[2] M. Diarra, C. Delerue, Y.M. Niquet, and G. Allan, J. Appl. Phys., accepted.

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