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Size-dependent ionization of impurities in GaN nanowires JOONAH YOON, ILAN SHALISH, School of engineering and applied sciences, Harvard University, L. R. RAM-MOHAN, Physics, Worcester Polytechnic Institute of Technology, VENKATESH NARAYANAMURTI, School of engineering and applied sciences, Harvard University — The integration of nanowires into devices requires having dielectric materials in contact with the nanowire. Therefore understanding the effect of surrounding dielectric materials on properties of nanowires becomes quite relevant for the device integration of nanowires. In this work we present the effect of dielectric surroundings on electrical properties of gallium nitride nanowires. The conductivity of unintentionally n-doped gallium nitride nanowires is measured from 4.2 to 300 Kelvin. The ionization energies of impurities are extracted from the conductivity versus temperature measurements. These ionization energies are found to display a dependence on the radius of nanowires. This size dependence is explained by the self-energy correction due to the image charges formed at the surface of nanowires. We would like to emphasize this work is the first experimental work to report on the size-dependent ionization of impurities in nanowires

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