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A non-contact solution-based method to measure the electric dipoles of p-n silicon nanowire diodes MINH THANG HOANG[1], Rutgers University, GOZDE TUTUNCUOGLU, AMAR MOHABIR, Georgia Institute of Technology, LEONARD FELDMAN, Rutgers University, MICHAEL FILLER, Georgia Institute of Technology, JERRY SHAN, Rutgers University — Dispersions of nanowires with p-n junctions are emerging as next-generation electronic colloidal materials. Developing the ability to efficiently manipulate such nanostructures for both characterization and separation based on electronic properties is crucial for scientific understanding and technological applications. Here we present a method for measuring the permanent and induced dipoles of p-n doped silicon nanowires by observing their rotation in fluid suspension under external electric fields. The permanent dipoles are formed by the opposite charges in the depletion layer at the p-n junction, while the induced dipoles are formed by nanowire polarization under the external field. The measured electrical torque exerted on the p-n nanowires due to applied DC and AC fields yields the permanent and induced dipoles. We then show how the dipoles change for nanowires of various doping concentrations and surface passivations. Numerical results also suggest a relation between the permanent dipole and the depletion width of the nanowire diode. This non-contact measurement method offers a new approach to efficiently determine the electronic properties of p-n nanowires, and is a significant step toward the high-throughput characterization and separation of complete nanowire devices.

[1]Membership Pending

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