Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Transport properties of nucleotides in a graphene nanogap for DNA sequencing[1] J. PRASONGKIT, A. GRIGORIEV, R.H. SCHEICHER, Condensed Matter Theory Group, Dept of Physics and Astronomy, Uppsala University, Sweden, R. AHUJA, Condensed Matter Theory Group, Uppsala University, and Royal Institute of Technology (KTH), Stockholm, Sweden — The application of graphene nanogaps for DNA sequencing has been proposed [H. W. Ch. Postma, Nano Lett. 10, 420 (2010)]. We used density functional theory and the non-equilibrium Green's function method to study the electron transport properties of nucleotides located inside a graphene nanogap. Our setup considered different positions and orientations of the bases with respect to the graphene electrodes, and we analyzed how the transmission spectra depend on such shifts and rotations. Even when taking into account current changes due to base fluctuations, we find that each nucleotide possesses a different characteristic current magnitude, owing to its distinctive electronic properties. Based on our results, it thus seems that the electrical readout from a graphene nanogap could in principle be sufficiently sensitive to distinguish between the four nucleotides, and thus achieve the goal of rapid and economical whole-genome sequencing.

[1]Swedish Research Council (VR, grant no. 621-2009-3628)

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Date submitted: 08 Dec 2010 Electronic form version 1.4