Docking DNA at the edge of graphene

E.P. van Geest, G.F. Schneider, J. van Ruitenbeek
Leiden University, The Netherlands
e.p.van.geest@lic.leidenuniv.nl

Devices that are aimed at using a tunnelling current to sequence DNA, with two graphene sheets lined up in a twisted configuration, cannot operate without a means to put the DNA strand at the graphene edge, where the tunnelling current is flowing. We aim to dock DNA and visualize the process at the same time, using a dual-action approach. We make use of two photochemical principles: on the one hand the so-called DNA light switch molecules, typically ruthenium complexes that light up when they bind to DNA, and on the other hand the fluorescence quenching effect of graphene, which is strongly dependent on the distance between the dye and the quenching species. By using both principles, we can design a platform that can dock DNA to a graphene edge through binding a ruthenium complex that is installed to the edge via a flexible linker, and show that the DNA is docked with fluorescence: as we can electrostatically change the distance between the edge and the ruthenium-DNA adduct, the fluorescence of this adduct will switch on and off, showing that the DNA is installed at the edge.

Figures