Conductivity of a single DNA duplex bridging a carbon nanotube gap

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Abstract

We describe a general method to integrate DNA strands between single-walled carbon nanotube electrodes and to measure their electrical properties. We modified DNA sequences with amines on either the 5' terminus or both the 3' and 5' termini and coupled these to the single-walled carbon nanotube electrodes through amide linkages, enabling the electrical properties of complementary and mismatched strands to be measured. Well-matched duplex DNA in the gap between the electrodes exhibits a resistance on the order of 1 MΩ. A single GT or CA mismatch in a DNA 15-mer increases the resistance of the duplex ~300-fold relative to a well-matched one. Certain DNA sequences oriented within this gap are substrates for *Alu* I, a blunt end restriction enzyme. This enzyme cuts the DNA and eliminates the conductive path, supporting the supposition that the DNA is in its native conformation when bridging the ends of the single-walled carbon nanotubes.