

DNA FROM AN ELECTRICAL POINT OF VIEW – POTENTIAL BUILDING BLOCKS FOR MOLECULAR ELECTRONICS

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In the progress of miniaturization of devices the next step leads from nano sized circuits to molecular electronics. To overcome the problems of spatial resolution, reproducibility and renewable resources DNA could be a feasible solution. The potential of double-stranded DNA (dsDNA) regarding long range charge transport has been shown in literature [1], but still needs to be investigated, to which extent this molecular property can be manipulated by modifications (e.g. metal ions [2], dyes [3]). Some incorporated modifications showed electrical behavior like diodes [4], switches [5] or charge splitter [6].

Here we present a method capable of selectively introducing metal ions into dsDNA [1d]. To achieve this, hydroxyquinoline (Hq) was incorporated multiple times as artificial base pair. After hybridization with different metal ions the influence on the conductivity of the dsDNA was investigated by scanning tunneling microscopy mechanically controllable break junction measurements (STM MCBJ).

Experiments with an intercalation dye containing a metal ion showed promising results in terms of improving the conductivity of dsDNA. Hq-modified dsDNA should provide the same potential as a given intercalation dye, but with well-defined position in the double helix. If the research of Hq-modified dsDNA succeeds, it would open up the field for more complex modifications, which could be sensors to pH value, distinct metal ions, gate potential or even light.

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