# Charge Transport through on-surface synthesized oligomers

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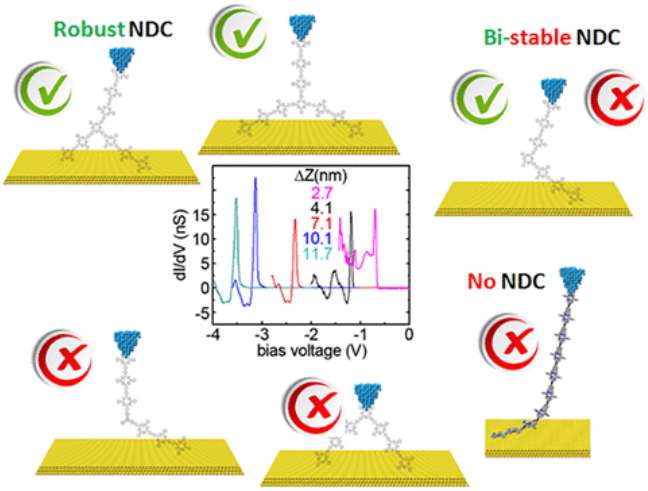
We used on-surface synthesis to form poly-porphyrin oligomers out of a precursor molecule 5,15-bis-(4-bromophenyl)-10,20-diphenylporphyrin on a Au(11) surface. By controlling the synthesis temperature, oligomers of linear, T-branched and 90°-kinked morphologies were synthesized. Using a scanning tunneling microscope, we lifted the single oligomers by the STM tip to form single-molecule junctions and measured molecular conductance. In the linear oligomers, we observed multiple sharp conductance peaks, conductance as high as 20 nS in the oligomers with length of >10 nm, and nearly length-independent conductance (attenuation <0.001 $Å^{-1}$). The first-principles simulations reveal that the sharp conductance peak is coherent resonant transport via a delocalized molecular orbital. The T-branched and 90°-kinked oligomers exhibit negative differential conductance (NDC). In comparison, the 120°-kinked oligomers formed by incorporating a precursor molecule with three-fold symmetry do not show NDC. The NDC effect is attributed to the interruption of delocalized molecular orbitals due to the 90° junctions embedded in the oligomers.




References:
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