Quantum interference effects on charge transport through a single benzene ring

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We explore charge transport through a single benzene ring, which is a prototypical molecular system where quantum interference effects are expected. Using the mechanically controllable break junction technique, we measured the low-bias conductance of molecular junctions where the benzene ring is wired between gold electrodes through thienyl anchoring groups and ethynyl spacers. We show that the conductance for a *meta*-coupled benzene ring is more than an order of magnitude smaller than that of a *para*-coupled benzene. The dramatic reduction of the conductance is consistent with destructive quantum interference effects in the *meta*-coupled benzene. This is supported by non-equilibrium Green's function calculations that confirm the occurrence of quantum interference in these systems.

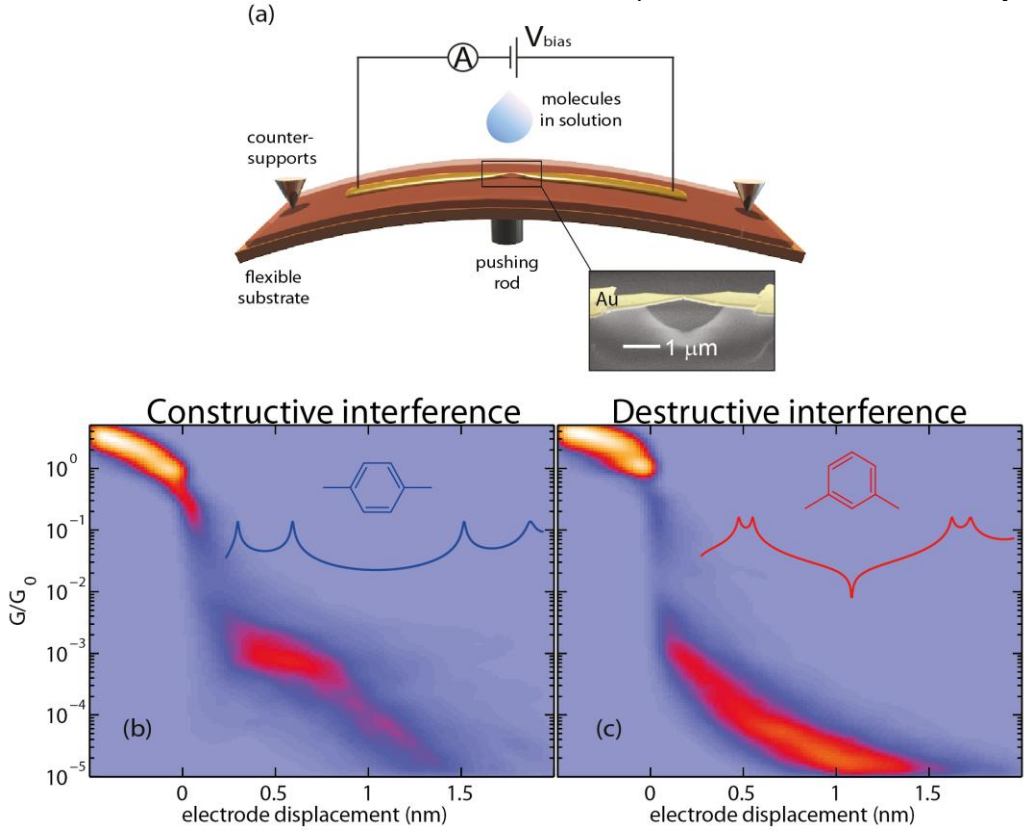

Figure. (a) Layout of a mechanically controlled break-junction (MCBJ) setup. Two-dimensional trace histograms constructed from 500 consecutive breaking traces taken at ambient conditions and 0.1 V bias for junctions exposed to molecules coupled in (b) *para* and (c) *meta* configuration. Calculated transmission of *para* (blue line) and *meta* (red line) in the gas phase.