Long-lived charged states in porphyrin nanoribbons

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Abstract:

We will demonstrate that sub-5 nm porphyrin nanoribbons1 can be charged inside two-terminal single molecule junctions in which the charged state can persist for many seconds under ambient conditions.2 This phenomenon is possible due to the presence of a localized molecular eigenstate close to the Fermi edge of the electrodes which can be accessed by applying a moderately high bias voltage of about 1.0 V. Upon charging, the low-bias molecular conductance is boosted by approximately two orders of magnitude which gives rise to a hysteretic I-V response. This opens the door to the tantalizing possibility that these long-lived charged states may lead to memristor architectures or redox-based molecular memories in future two-terminal devices. The ambient operation highlights that special environments, low temperatures or ultra-high vacuum conditions are not prerequisites for stable charged molecular junctions.

Figure 1. Schematic demonstrating the two channel mechanism of charge transport in porphyrin nanoribbons.

References:
