Electron transmission through a single molecule

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STM and break junction techniques at low temperatures allow manipulation of individual atoms and molecules. By such methods one can form wires connecting the two electrodes, formed by a single (organic) molecule. The current transport properties of these nanowires show deviations from the well know ohmic current-voltage relation at specific characteristic energies, corresponding to the vibration modes of the molecular junctions. These vibration modes, on the one hand, are exploited for characterization of the molecular wire configurations. On the other hand, the physical mechanisms involved in electron-phonon interaction at the single-molecule level can be investigated in detail. In addition, the numbers of conductance channels available for current transport can be characterized by measuring shot noise. In this work we focus on small molecules having a high transmission probability for the electrons, including H_2, benzene (C_6H_6), CO, CO_2, H_2O, and isotopes.