

High current-bias effects in atomic and molecular junctions

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Single-atom and single-molecule junctions survive surprisingly high currents. This fact is understood as being due to the ballistic character of the electron transport. The major part of the dissipation of energy takes place inside the leads, at a large distance from the junction. This permits the study of atomic and molecular wires under extreme non-equilibrium conditions. Under such conditions the fundamental processes of electron-electron and electron-ion scattering can be revealed and studied. For this study we employ break junction techniques and scanning tunneling microscopy. One of the tools revealing the statistics of electron scattering effects is the measurement of shot noise. We have extended the range of shot noise spectroscopy up to 10 MHz, which opens a new window on the scattering phenomena. By low-temperature STM experiments we can reveal single-ion diffusion and migration induced by the high current bias.