

Optoelectronics on the atomic scale – what we can learn from STM on single molecules

When we talk about molecules in scanning tunneling microscopy (STM), we typically refer to a geometry that essentially consists of a molecule that is sandwiched between two tunnel barriers and metal electrodes. Basically, this corresponds to the geometry of an organic resonant tunnel diode, or photodiode, if dyes are used instead of just any molecule. Only in this case, instead of a huge ensemble of molecules arranged in a thin film, we have a single molecule. And instead of a plate capacitor-like arrangement of electrodes, one electrode is an atomically sharp tip that allows us to observe and manipulate the molecule with atomic resolution and precision.

In my talk, I will show you how this allows us to understand what happens during charge transport through a molecule and what possibilities there are to actively control the light emission from such a single-molecule tunnel photodiode.