

The atomic-scale plasmonic switch

Initiative: Integration molekularer Komponenten in funktionale makroskopische Systeme (beendet, nur noch

Fortsetzungsanträge)

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Laufzeit: 3 Jahre

The aim of this project is the development of a new generation of plasmonic switches and transistors operating on the atomic scale and with atomic precision on the basis of the Single-Atom Transistor (SAT) developed by the KIT group - the ultimate goal being the Single-Atom Plasmonic Transistor, a novel, three-terminal device operating at the quantum level that allows combined electronic and plasmonic switching by means of the controlled and reversible relocation of one single atom. While the electrical quantum transport properties and also the switching process itself are intensively studied both experimentally and theoretically and are meanwhile rather well understood, no attempt has been made so far to study the switchable plasmonic coupling of these reversibly opening and closing atomic-scale bridges between the two nanoscale metallic contacts. The project aims at studying the effect of the reversible coupling by a metallic bridge on the plasmonic resonance shift due to the coupling of the two metallic objects - experimentally and by means of simulations. At the same time, it aims at the development of a new class of devices: atomic-scale, reversibly switchable plasmonic devices, which allow plasmonic switching with an atomic quantum switch under electrical control. This is a first step into the realm of atomic-scale plasmonics, opening intriguing perspectives for combined plasmonic-electronic quantum devices with control on the single-atom level.

Projektbeteiligte

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