
O 37: Invited Talk (Paul M. Koenraad)

Time: Wednesday 9:30–10:15

Location: H36

Invited Talk

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Single impurities in semiconductors studied by STM — ●PAUL KOENRAAD — Eindhoven University of Technology

Single impurities play an increasingly important role in devices and fundamental physics. In the emerging field of solotronics, where a solitary dopant determines the optoelectronic functionality, many exciting successes have recently been obtained. We use a Scanning Tunneling Microscope (STM) to examine and manipulate single (magnetic) impurities close to a natural cleavage plane of the semiconductor host to unravel their properties that can be strongly affected by the semiconductor-vacuum interface.

Cross-sectional Scanning Tunneling Microscopy (X-STM) is a unique tool that allows controlling the ionization state of single impurities and

spatially resolving the shape of the wavefunction of a single hole or electron bound to an impurity atom. Such information is very valuable for the identification of the character of the electronic state and its interaction with the environment which can be strained or involve optical and magnetic fields.

In this presentation I will discuss 1) wavefunction imaging of single impurities with a different chemical nature 2) Fe doped GaAs where we have shown that we can manipulate the oxidation or valence state of a single Fe impurity by controlling the population of an internal d-shell. 3) the behavior of single magnetic impurities in a strong magnetic field 4) a memory that is based on a single bistable Si impurity in the surface layer of GaAs. Optical and voltage dependent measurements in our STM revealed interesting properties of this bistable Si atom.