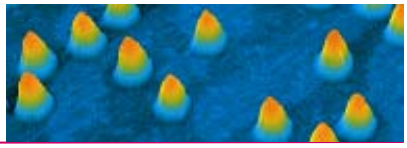
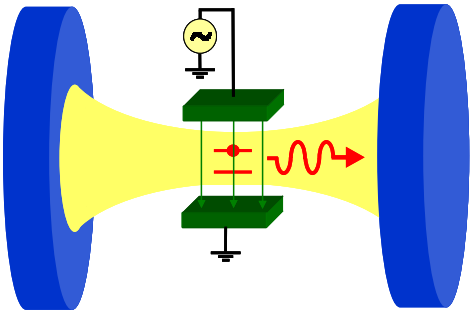
Technische Universiteit
Eindhoven
University of Technology



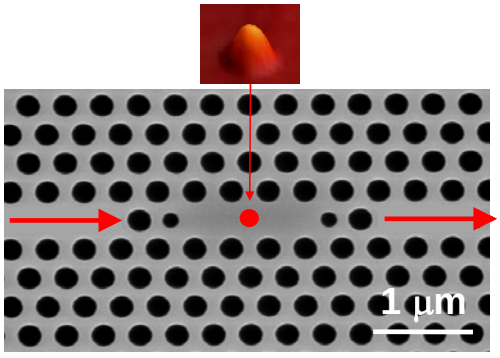
Two PhD positions on solid-state cavity quantum electrodynamics

The Photonics and Semiconductor Nanophysics group at the Eindhoven University of Technology (The Netherlands, www.tue.nl) has two open PhD student positions on the physics of single quantum dots in semiconductor nanocavities. Quantum dots (QDs) are semiconductor nanostructures with a three-dimensional confinement potential, resulting in a quantized energy structure and atom-like radiative emission properties. Single QDs in optical nanocavities provide an ideal framework to investigate cavity quantum electrodynamic (QED) effects in a solid-state environment, with important potential applications to quantum information processing.



Position 1: Dynamic control of cavity QED

This project, funded by the Dutch FOM, aims at investigating the dynamic control of cavity QED effects by the application of ultrafast electric fields. By applying a time-dependent electric field on QDs in photonic crystal nanocavities, we will dynamically tune the exciton energy and therefore control the coupling with the cavity mode in a timescale faster than the spontaneous emission time. We aim at demonstrating the control of the photon waveform, and the generation of entangled light-matter states, by the control of the weak- and strong-coupling regime, respectively.



Position 2: Single-photon nonlinear optics

This project, part of a TU/e High-Potential Research Program, aims at the investigation of single-photon nonlinearities in QD-cavity systems. We will study the transmission properties of a photonic crystal cavity when a single QD is resonant with it. Due to the strong coupling between excitons and photons, we expect to observe nonlinear effects at the single-photon level. Additionally we aim at demonstrating a single-photon optical transistor by using a second beam to control the excitonic population. Such a device would have important applications in classical and quantum photonic integrated circuits.

We welcome applications from excellent candidates with a degree in condensed-matter or optical physics. Candidates must prove a strong attitude towards experimental physics. Please email (max 300 kB) a CV with name and address of two references to: **Prof. Andrea Fiore, email: a.fiore@tue.nl**