

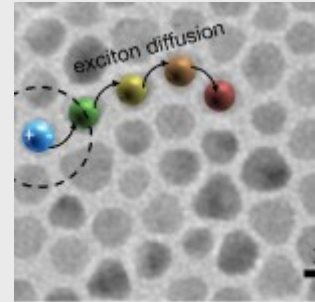
Photonics of Excitonic Nanomaterials: Understanding and Controlling the Flow of Energy

Title: Photonics of Excitonic Nanomaterials: Understanding and Controlling the Flow of Energy

When: Tuesday, 15 March (2016), 12:00h

Place: Departamento de Física de la Materia Condensada, Facultad de Ciencias, Module 3, Seminar Room (5th Floor).

Speaker: Ferry Prins, Swiss Federal Institute of Technology, ETH Zürich, Zürich, Switzerland.



The excited state properties of nanoscale semiconductors are dominated by the dynamics of quantum confined electron-hole pairs known as excitons. Thanks to recent advances in the size and shape control of semiconductor nanomaterials, this confinement can now be tuned with high precision which has resulted in a rapidly expanding family of high-quality excitonic building blocks. However, while extensive research has been done to understand and control the excitonic properties of the isolated building blocks, comparatively little is known about exciton dynamics in nanoscale assemblies.

In the first part of the talk, I will present some of our recent efforts in trying to understand and control the exciton dynamics in nanomaterial assemblies. Specifically, I will discuss a new transient microscopy technique with which we can spatially resolve exciton diffusion in colloidal quantum-dot films. In addition, I will present our findings of anomalous excitonic energy-transfer dynamics between zero-dimensional colloidal quantum-dots and two-dimensional MoS₂ monolayers.

In the second part of the talk, I will present new strategies for the assembly of excitonic building blocks into high quality wavelength-scale patterns using template stripping of colloidal quantum dot films. I will show that this technique can produce high-quality quantum-dot based grating structures that can significantly modify the optical properties of these films, yielding enhanced and highly directional outcoupling of fluorescence as well as reduced lasing thresholds.

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