

Project 4.8 Fluorescence of single I-III-VI colloidal nanocrystals (experimental)

Supervisor: dr hab. Łukasz Kłopotowski

Institute: IF PAN

Unit: SL 3.2

www: <http://klopotoski.com/physics>

Background:

Single nano-objects are particular light emitters — they emit single photons one by one. The resulting photon stream carries information on the quantum nature of the emitter and about its interaction with the environment. The successful candidate will investigate single semiconducting nanocrystals belonging to the group of ternary I-III-VI compounds such as CuInS₂. This family of nanostructures constitutes a more environmentally friendly alternative to the better known cadmium and lead chalcogenides. However, the mechanism of light emission in these ternary nanocrystals is still a subject of a debate.

Aim:

The aim of the work is to understand the process of light emission in I-III-VI nanocrystals and develop procedures to tailor the fluorescence properties toward specific applications. The candidate will employ state of the art spectroscopic techniques to study exciton recombination dynamics, multiexciton generation, and carrier trapping by surface states. To determine the impact of nanocrystal architecture on the optical properties, she/he will investigate fluorescence dynamics, spectral diffusion, and photon correlations on a single particle level. The experiments will be carried out in custom-built setups and the candidate will participate in aligning it. She/he will develop tools for advanced data analysis. He/she will take part in nanocrystal synthesis, sample design and preparation for experiments. She/he will also conduct ensemble level optical characterization studies. The successful candidate will join a young group of researchers working on various nanostructure systems with a view of applications ranging from optoelectronics to nanomedicine.

Requirements:

- Master's degree (or equivalent) in physics, chemistry, or related field,
- experience with optical spectroscopy,
- experience with data analysis tools,
- proficiency in English,
- excellent team work
-

Funding:

Scholarship: grant funding of 4000 PLN per month, before subtracting obligatory employer and employee social security contributions (~15%), for 12 months. Afterwards, standard Polish PhD scholarship (about 2100 PLN/month net in year 2, 3240 PLN/month net in years 3-4). Additional funding will be sought to increase the scholarship in years 2-4.

Contact: lukasz.klopotoski@ifpan.edu.pl