

Synthesis of InP Nanocrystals in a Flow Reactor

Contact : Peter REISS DRF//INAC/SYMMES/STEP peter.reiss@cea.fr 0438789719

Stage pouvant se poursuivre en thèse : Oui

Résumé :

This internship focuses on the development of the continuous flow synthesis of colloidal InP quantum dots (QDs). InP-based QDs are very promising candidates for many optoelectronic applications, in particular LEDs and displays. The optimization of the experimental parameters in view of the special requirements for flow synthesis will be the central point of the project. The candidate will also carry out the characterization of the obtained materials using different spectroscopic techniques.

Sujet détaillé :

Semiconductor nanocrystals (or QDs) have attracted growing attention due to their tunable properties arising from the small size, known as the quantum confinement effect. Offering exceptionally narrow emission profiles, the broadest available color gamut and a high brightness, QDs are one of the key components in future lighting and display applications. Their production is currently still performed in batch reactors and is thus limited in terms of up-scaling and quality control. Continuous processes in contrast offer advantages such as online monitoring, high reproducibility and large production rate, coupled with simple automation.

The present project focuses on the continuous synthesis of InP nanocrystals in a flow reactor using a novel synthesis procedure developed in our lab. InP nanocrystals are promising, less toxic candidates (compared to cadmium-based compounds) for various applications. The new synthesis route is based on new types of precursors, which are compatible with the flow process and easier to handle than those conventionally used in InP QD synthesis. The aim of the project is to screen various precursor compounds and process parameters in order to optimize the reaction conditions of the continuous flow synthesis. The quality of the obtained QDs will be assessed by measuring their optical properties using UV-vis absorption spectroscopy, steady-state and time-resolved PL emission spectroscopy. Other characterization techniques include FTIR, TGA, and NMR. Most parts of the project will be carried out in a newly set up chemistry lab dedicated to the continuous flow synthesis of nanoparticles.

Compétences requises :

Chimie de matériaux, génie chimique