

Spécialité de Master « Optique, Matière, Plasmas »

Stage de recherche (4 mois minimum, à partir de début mars)

Proposition de stage (ne pas dépasser 1 page)

Date de la proposition :

Responsable du stage / internship supervisor:			
Nom / name:	Voliotis	Prénom/ first name :	Valia
Tél :	01 44 27 46 32	Fax :	
Courriel / mail:	voliotis@insp.jussieu.fr		
Nom du Laboratoire / laboratory name: Institut des NanoSciences de Paris			
Code d'identification :	UMR 7588	Organisme :	UPMC, CNRS
Site Internet / web site:	http://www.insp.jussieu.fr		
Adresse / address:	4 place Jussieu, 75005 Paris		
Lieu du stage / internship place:	4 place Jussieu, 75005 Paris		

Titre du stage / Coherent control of quantum dot molecules
Résumé / summary Single spins confined in semiconductor quantum dots have been proposed as the building blocks for optoelectronic logic gates [1]. For applications in quantum information processes it is necessary to entangle at least two qubits and promising candidates are the coupled semiconductor quantum dots, so called quantum dot molecules (QDM). This coupled system offers the possibility to study the fundamental mechanisms of interaction between two spins which will also allow controlling the entanglement. One of the basic experimental difficulties limiting the use of quantum dot molecules is the challenge of fabricating two, closely spaced quantum dots with accurate control of their size and shape. We propose here to develop a novel method of fabrication of quantum dot molecules based on the overgrowth of nanohole patterned substrates [2]. These nanoholes provide an additional level of control over the size, shape and spacing of the quantum dots, increasing the flexibility of the design of quantum dot molecule structures. The project consists of two parts: 1) design and optimisation of quantum dot molecules, involving the use of a state-of-the-art molecular beam epitaxy machine based at the INSP, 2) optical measurements to determine the level of coupling between dot molecules of different designs, and to determine the optimum design to control the spin-mixing of quantum dot molecules. Coherent control experiments with short resonant laser pulses will allow addressing and manipulating the quantum states but also investigate the coherence properties of the system. During this master internship, the student will participate to the design, optimization and growth of the QDM and to the first optical characterization measurements. [1] See e.g. Physical Review B 86, 085319 (2012) [2] e.g. J. Appl. Phys. 112, 054303 (2012)
Toutes les rubriques ci-dessous doivent obligatoirement être remplies

Ce stage pourra-t-il se prolonger en thèse ? Possibility of a PhD ? : oui			
Si oui, financement de thèse envisagé/ financial support for the PhD: ED			
Lasers et matière	x	Lumière, Matière : Mesures Extrêmes	x
Optique de la science à la technologie		Plasmas : de l'espace au laboratoire	

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