Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website www-csc.utt.fr)

Supervisor's name : JIANG Given names : Quanbo

Status (prof., assistant prof., …) : Assistant prof.

Laboratory : Light, nanomaterials, nanotechnologies (L2n), CNRS Website address : l2n.utt.fr

Institution : University of Technology of Troyes (UTT) Website address : www.utt.fr

Scientific competence of the supervisor:

Optical tweezers, thermophoresis, nanophotonics, plasmonics, metasurface, optical chirality.

Two major publications in the field proposed for the PhD :

1. Quantifying the Role of the Surfactant and the Thermophoretic Force in Plasmonic Nano-Optical Trapping. Quanbo Jiang, Benoît Rogez, Jean-Benoît Claude, Guillaume Baffou, Jérôme Wenger. Nano letters, 2020, 20,
2. Plasmonic nano-optical trap stiffness measurements and design optimization. Quanbo Jiang, Jean-Benoît Claude, Jérôme Wenger. Nanoscale, 2021, 13, 4188–4194. DOI: 10.1039/D0NR08635E

Website address of the personal page : https://recherche.utt.fr/light-nanomaterials-nanotechnologies-

Supervisor's email : quanbo.jiang@utt.fr

Description of the research work proposed for a PhD ***Topic # (see list) :*** I-3

Title : opto-induced thermophoretic study under the local temperature gradients

Subject :

Analysis of forces of a macro-object in the aqueous environment has been well developed in the modern physics. However, with reducing the object size below the diffraction limit, the study becomes more and more complicated which might be impacted from different aspects such as Brownian motion, solution convection, surface interaction and so on so forth. In our case, objects typically have the size in the Rayleigh scattering regime and are dispersed in the solution near the metallic structure. Since the laser is applied on the object as well as the structure simultaneously, the optical and thermal gradients are able to modify the distribution of forces exerted on the object. To estimate these forces in a very weak range, theoretical modeling and simulation have to be implemented. The analytical and numerical results will be compared with experimental results from the commercial system of optical tweezers and then improved by adding more possible parameters such as PH, salts, surface charges etc. to modify the Soret coefficient. The basic optical and thermal gradient forces are expected to be thoroughly investigated during the Ph.D. thesis with the help of confocal microscope, fluorescence correlation spectroscopy and scanning probe techniques.

Keywords :

Light-matter interaction, thermophoresis, optical tweezers.

Expected collaborations :

Prof. Joël Bellessa, Institut Lumière Matière, Université de Lyon 1. Website of the personal page: https://ilm.univ-lyon1.fr/index.php?option=com_directory&task=profile&id=5

Background required from the applicant :

The desirable candidates must hold master degree who have a strong background in Physics, Optics or Nanophotonics. Passion for experimental physics will be an asset. Experience in a scientific project involving either optical microscopy, numerical simulation or nano/microfabrication will be highly appreciated.

Existence of a PDF file detailing the proposal ("yes" or "no") : no

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