PhD Studentship: Highly Ordered Nanophotonic Systems

Location: King's College London

Nanomaterials are a promising class of materials characterized by unique and often size-dependent properties that are distinct to those of their bulk equivalents. Since their discovery, they have become a prominent feature in the material science research landscape. Yet, their translation into technologies have been limited, owing in part to a lack of techniques for controllable manipulation and localization of colloidal nanomaterials into well-ordered heterostructures. As such, the development of facile, scalable and low-cost fabrication of nanoparticle heterostructures is a pre-requisite for many technological applications of nanomaterials, including light-harvesting, quantum information and photocatalysis.
In parallel to the developments in the synthesis of colloidal nanomaterials, the last decade saw great developments in combinatory self-assembly and localization methods involving the use of optical, dielectrophoretic, capillary and chemical forces. The project aims to explore the realm of what is achievable with such self-assembly methods, with respect to the fabrication of highly ordered heterostructures of nanoparticles and with regards to the tailoring of physico-chemical properties of such heterostructures. The project will also aim to extend the scope of the applicable techniques by developing new approaches to high-accuracy organization of colloidal nanomaterials of various compositions.

As part of the PhD, the candidate will have an opportunity to work with nanomaterials such as metallic nanoparticles, semiconductor quantum dots, conjugated polymer nanoparticles and carbon nanoparticles. The candidate will be introduced to a number of self-assembly, localization and nanofabrication techniques (e.g. EBL), as well as surface functionalisation methods. The investigations of the physical and chemical properties of the developed heterostructures will involve a variety of microscopies and spectroscopic techniques such as Tunnelling and Scanning Electron Microscopies, Fluorescence Lifetime Imaging Microscope, UV-visible spectroscopy, Fluorescence Spectroscopy. These studies will be supported by numerical simulations via finite-element methods, using software packages such as Comsol Multiphysics, CST Microwave Studio or Lumerical.

Supervisor: Dr A Rakovich
Deadline: Monday, May 31, 2021
Funded PhD Project (European/UK Students Only)

For more information and to apply:
https://www.findaphd.com/phds/project/phd-studentship-highly-ordered-nanophotonic-systems/?p129453