Interactions of Electrically Forced Colloids in a Conducting Liquid

Supervisors:
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Description - When submitted to electric fields, colloidal suspensions show transitions from ordered to disordered 'phases', depending on the phase/amplitude of the electric field, the nature of the electrolyte and the nature of the colloidal particles. The fine control of such properties can be exploited for the generation of new advanced functional materials with interesting optical properties (phase objects, diffraction gratings) or mechanical properties (composite materials, self-lubricant compounds). Electrically driven collective behaviours of colloids have been extensively studied in 2D (close to a plane), but very few 3D (bulk) studies have been performed so far.

The objectives of the project are (i) to experimentally investigate the bulk pair interaction of two colloids via optical tweezers, (ii) to model the combined electrical-hydrodynamic pair interaction based on hydrodynamic and electrophoretic considerations, (iii) to model the collective behaviour of an assembly of colloids using a simplified version of the pair-interaction model.

During the project, the candidate will engage in collaborations with other members of the Schools and the University. Experience in colloidal and interface science, fluid dynamics, data analysis/modelling is desirable although not a requisite.

Applicants should have, or expect to achieve, at least a 2:1 Honours degree (or equivalent) in Physics or Mechanical Engineering or a related subject. A relevant Master's degree and/or experience in one or more of the following will be an advantage: Applied Mathematics, Theoretical and Experimental Fluid Dynamics, Colloids and Interface Science.

Funding information:

Please note that studentships will be awarded on a competitive basis to applicants who have applied to this project and other advertised projects starting with advert reference 'WSS' for the School of Mechanical, Electrical and Manufacturing Engineering.

If awarded, each 3-year studentship will provide a tax-free stipend of £14,777 p/a, plus tuition fees at the UK/EU rate (currently £4,260 p/a). **While we welcome applications from non-EU nationals, please be advised that it will only be possible to fund the tuition fees at the international rate and no stipend will be available.** Successful candidates will be notified by 26th March 2019.