A PhD or Master studentship is available at the Polymer and Colloid lab of IESL -FORTH in collaboration with SCHLUMBERGER CAMBRIDGE RESEARCH

The project will be supervised by **Prof. George Petekidis** (Dept. of Materials Science and Technology, University of Crete and IESL-FORTH) and **Dr. Andrew Clarke** (SCHLUMBERGER CAMBRIDGE, UK).
The studentship is offered for 3 years for a PhD level student (with a monthly stipend of 900 euro) or for 2 years for a Maters level student (with a monthly stipend of 500 euro). Candidates should hold a Batchelor's degree in Physics or Chemistry or Material Science or Engineering or related fields.

Expression of interest and contact: G. Petekidis (georgp@iesl.forth.gr)

Details of the project are provide below.

Structure and stability of multicomponent colloidal formulations for energy applications

Background: Attractive colloidal systems find widespread use over a wide range of industries. These systems, through their colloidal attractions, form a system spanning structure and therefore a yield-stress. Moreover, in the case of anisotropic particles (such as rods or platelets) they form such structures at relatively low volume fractions and therefore provide the desirable material properties at low-cost. However, the systems are intrinsically metastable, i.e. out-of-equilibrium, and the nature of the interactions leads to evolution of the underlying structure, both quiescently and under flow. This evolution is usually undesirable in terms of the final properties of the product. Thus, formulations often include multiple particles to maintain desirable properties whilst controlling the undesirable time- or flow-dependencies.

In recent years, whereas the structural evolution of single-component attractive gels has largely been elucidated, the balance of forces and behaviours within multicomponent attractive gels has not. Additional components enable additional degrees of freedom and several recent studies have already demonstrated emergent behaviour previously unsuspected.

Examples of formulations generating structures of particular interest to both current and future business are (i) drilling fluids where multiple particle shapes may be used (sepiolite, bentonite) in conjunction with emulsions, (ii) flow batteries with carbon particles or carbon nanotubes, or battery electrolyte slurries, (iii) high thermal conductivity phase-change emulsions.

Objectives: Elucidate the detailed interactions and emergent structures of multiply interacting metastable emulsio-particulate systems including rod-like particulates. Determine how to control the structure of such systems and thus the material mechanical or electrical or thermal properties. To this end state-of-the art combined rheometry and optical (including confocal) microscopy will be used to simultaneously determine the microstructure and the mechanical and electrical properties.