ESPCI
Laboratoire PMMH
10 rue Vauquelin, 75231 Paris Cedex 05

Séminaire PMMH

Bureau d'Études, Bâtiment L, 2 ème étage Amphithéâtre Urbain (A1), Escalier N, rez-de-chaussée

Vendredi 16 octobre 2015, 11h00-12h00

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Rheological properties and microscopic flows of suspensions of the non-motile green micro-alga *Chlorella Vulgaris*

In the first part of the talk I will present a systematic study of the rheological properties of solutions of non-motile micro-algae (Chlorella vulgaris CCAP 211-19) in a wide range of volume fractions is presented. As the volume fraction is gradually increased, several rheological regimes are observed. At low volume fractions (but yet beyond the Einstein ultra diluted limit), the suspensions display a Newtonian rheological behaviour and the volume fraction dependence of the viscosity can be well described by the Quemada model (Quemada, Eur Phys J Appl Phys 1 :119-127, 1997). For intermediate values of the volume fraction, a shear thinning behaviour is observed and the volume fraction dependence of the viscosity can be described by the Simha model (Simha, J Appl Phys 23 :1020-1024, 1952). At even higher volume fractions a yield stress behaviour is observed. To gain further insights into the physical origins of the shear thinning and the yield stress behaviour, the microstructure of the suspension is investigated in-situ by direct visualisation of the rheometric flow using a home built Stereo-Micro-Rheo-PIV system.
In the second part of the talk I will present a detailed characterisation of plane micro- channel flows of Chlorella suspensions with volume fractions spanning each of the three rheological regimes highlighted above. I will particularly focus on the hydrodynamic reversibility of the micro-flows, the wall slip and its coupling to the bulk yielding transition. If time permits, a simple theoretical insight into the breakdown of the hydrodynamic reversibility of such micro-flows within the yield stress rheological regime will given using classical tools of the Statistical Physics.