Rhéologie de la matière Molle

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ABSTRACT

Microgels are soft particles composed of a cross-linked polymer network swollen in a solvent. They are deformable and can thus be packed to effective volume fractions greater than the random close packing limit for hard spheres, often even greater than one. Moreover, their softness can be tuned by varying their cross-link density. Hence, they offer great potential to study the behavior of suspensions at high packing fraction, exploring phenomena such as the colloidal glass transition or aging in colloidal glasses. Microgels are also excellent model systems to mimic natural products like globular proteins, casein micelles, or swollen starch granules, thus helping to gain insights into the behavior of these complex materials. In this project, the particle-to-polymer transition in paste of microgel particles at high concentration was studied. In isotropic compression the transition is observed directly at the onset of mechanical rigidity. In linear shear deformation however, non-affine motions shift the appearance of the transition to much higher compressions. Once yielded, the particulate nature of the material is refound even at very high compressions.
Three communications have been released in International Conferences (two in the US, one in europe). Two publications are actually under redaction.

Year : 2009
Project number : 0900-002
Type of funding : SP
Project type : PC
Research units in the network :
Start date : 2009-03-01
End date : 2010-03-31
Flagship project : no

Project leader : Paul Menut
Project leader's institution : InstitutAgro
Project leader's RU : IATE

Budget allocated : 19968 €
Total budget allocated (including co-financing) : 19968 €
Funding : RTRA

PERSPECTIVES

Such results open new routes to analyse the rheological behavior of natural products like wheat gluten which exhibit exceptional viscoelastic properties but which structure (polymeric or colloidal-like) remain subject to hot debate. Indeed, they show that a macroscopic rheological behavior at low deformation exhibiting the traditional feature of polymeric system is not incompatible with a colloidal structure at a microscopic level. A PhD thesis will be launch in 2010 in UMR IATE in order to explore the structure of wheat gluten suspensions with the background acquired during the project.