MICROGRAVITY SCIENCES AND PROCESSES (A2)
Gravity and Fundamental Physics (1)

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SEDIMENTATION AND INTERNAL DYNAMICS OF AN ATTRACTIVE COLLOIDAL GEL

Abstract

We use a combination of original light scattering techniques and particles with unique optical properties to investigate the behaviour of suspensions of attractive colloids under gravitational stress. Initially, isolated, small clusters fall forming a gelled deposit at the cell bottom. Our apparatus allows us to follow over time the concentration profile, the velocity profile and the local dynamics in the gel phase. During the compression regime, the sedimentation velocity grows nearly linearly with height, implying that the gel settling may be fully described by a (time-dependent) strain rate. The dynamics exhibits remarkable scaling properties when time is normalized by strain rate showing that the microscopic restructuring is completely driven by macroscopic deformation induced by gravity. In addition, we are able to measure the compressional modulus of the gel and to evaluate his porosity: we solved numerically a poroelastic model of gel sedimentation getting an excellent agreement with the experimental data.