

NON-UNIFORM FLOW OF COLLOIDAL GLASSES AND GELS: THE “SHEAR-GRADIENT CONCENTRATION COUPLING INSTABILITY”

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There are several types of shear-induced instabilities in soft-matter systems, like vorticity- and gradient-banding, that are by now well-understood. There is, however, an instability that can be referred to as “the Shear-gradient Concentration Coupling instability” (the SCC-instability) that has been largely ignored due to the lack of understanding of its microscopic origin, since its phenomenological description a few decades ago. This instability is due to a postulated shear-gradient induced mass flux together with a strong coupling of the stress to concentration. The origin of the shear-induced mass flux resulting from direct interactions is so far not understood, and explicit expressions for the corresponding transport coefficient have therefore not been derived. In this presentation, the origin of this mass flux is discussed, an explicit expression for the transport coefficient is presented, and numerical results are discussed for the stationary non-uniform flow profiles and concentration profiles of an initially SCC-unstable system, which will be compared to experiments on hard-sphere glasses

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