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Dissecting diffusive and advective motion in colloidal sedimentation by multi-speckle Ultra-Small-Angle XPCS JOHANNES MLLER, THEYENCHERI NARAYANAN, ESRF - The European Synchrotron — In colloidal suspensions internal or external fields can induce directed motions of particles in addition to Brownian diffusion. Here, gradients in temperature or chemical potential, shear flow as well as gravity can act as an external field. Examples for internal motions can be found in synthetic self-propelling particles and microorganisms, generally coined as active matter. We present multi-speckle X-ray photon correlation spectroscopy measurements in the Ultra-Small-Angle scattering range which probes an expanded length scale comparable to DLS and optical microscopy. To demonstrate the advanced capabilities, we show measurements probing the motions within a settling suspension of sub-micron sized silica particles. A global fitting procedure has been applied to separate the diffusive and advective contributions to the particle dynamics. With this, macroscopic parameters such as the sedimentation velocity can be probed on a microscopic level in highly opaque and concentrated systems, which are in general difficult to access for optical investigations. This procedure may prove its value for investigating various kinds of non-equilibrium systems.

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