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Drying colloidal suspensions in confined geometries

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We investigate the concentration process of dilute colloidal suspensions up to dense states in a confined geometry: the *microevaporator* [1, 2]. This tool is a microfluidic format of a continuous pervaporation experiment and allows a perfect control on an *out-of-equilibrium route* through drying. This confined geometry also allows the use of simple models, and the analysis of drying of mixtures permits, a priori, to access to both kinetic and thermodynamic informations (activity $a(\phi)$ and long time collective diffusion coefficient $D(\phi)$) [2]. We investigated the drying of different *soft matter* systems in this geometry: (i) monodisperse large colloids (sulfate latex, 500nm), and (ii) dispersions of smaller nanoparticles NPs (charged silica Ludox and gold NPs). We detail in each case some features of the drying process. Namely, we show using the first system, that we can form colloidal crystals or amorphous states using the microevaporation technique. We also show using microfocused SAXS experiments performed at ESRF [3], that the concentration of the charged NPs dispersion also leads to dense organized colloidal states. Finally, we will point out the crucial role played by the electrostatic interactions on the concentration process.

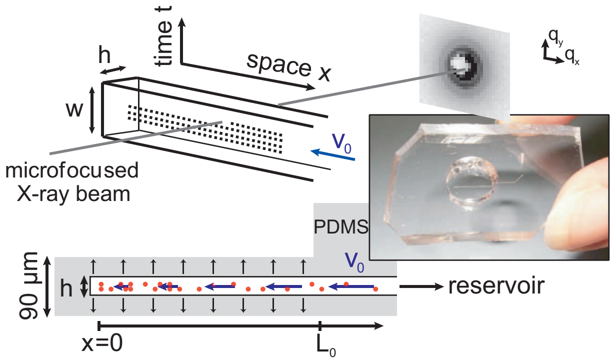

Fig. 1: *Bottom right: microevaporator made of PDMS. Colloids contained in the reservoir are convected up to the tip of the channel by the pervaporation-induced flow. Top: sketch of the experiments combining SAXS to investigate the concentration process. Figure extracted from Ref. [3]*

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Références

[1] J. Leng, B. Lonetti, P. Tabeling, M. Joanicot, and A. Ajdari, "Microevaporators for kinetic exploration of phase diagrams", Phys. Rev. Lett. **96**, pp. 084503 (2006).

[2] M. Schinlder and A. Ajdari, "Modeling phase behavior for quantifying micro-pervaporation experiments", Eur. Phys. J. E **28**, pp. 27 (2009).

[3] A. Merlin, J. Angly, L. Daubersies and C. Madeira and S. Schöder and J. Leng and J. B. Salmon, "Time-resolved microfocused small-angle X-ray scattering investigation of the microfluidic concentration of charged nanoparticles", Eur. Phys. J. E **34**, pp. 58 (2011).