Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Mass transport in a drying drop of a charged colloidal dispersion: new insights using Mach-Zehnder interferometry[1] BENJAMIN SOBAC, SAM DEHAECK, TIPs Lab - Universite libre de Bruxelles, ANNE BOUCHAUDY, JEAN-BAPTISTE SALMON, Laboratory of the Future - CNRS, Solvay, Univ. Bordeaux — In the present work, we use Mach-Zehnder interferometry to thoroughly investigate the drying dynamics of a 2D confined drop of a charged colloidal dispersion. This technique makes it possible to measure the colloid concentration field during the drying of the drop at a high accuracy (about 0.5.%) and with a high temporal and spatial resolution (about 1 frame/s and 5 μm/pixel). These features allow us to probe mass transport of the charged dispersion in this out-of-equilibrium situation. In particular, our experiments provide the evidence that mass transport within the drop can be described by a purely diffusive process for some range of parameters for which the buoyancy-driven convection is negligible. We are then able to extract from these experiments the collective diffusion coefficient of the dispersion $D(\varphi)$ over a wide concentration range $\varphi = 0.24.-0.5$, i.e. from the liquid dispersed state to the solid glass regime, with a high accuracy. The measured values of $D(\varphi) \simeq 5.-12 D_0$ are significantly larger than the simple estimate D_0 given by the Stokes-Einstein relation, thus highlighting the important role played by the colloidal interactions in such dispersions.

[1]This work was financially supported by the Fonds de la Recherche Scientifique F.N.R.S., the European Space Agency (ESA) and the Belgian Federal Science Policy Office (BELSPO).

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Date submitted: 03 Aug 2020 Electronic form version 1.4