

## Colloidal suspension

### ***A tool to observe the microscopic properties of material phases***

#### ***Week one: read general background***

- 1) Colloidal dispersions book: chapter 1 and 3 (3.1-3.3).
- 2) Papers from tamir pair correlation function. Brownian motion.
- 3) How particle tracking works.
- 4) Time and ensemble averaged MSD.

#### ***Week 2:***

- 1) Prepare a colloidal suspension of silica 1.5 um in water stock solution.
- 2) For the stock solution prepare a sample and take a movie of diffusion of the colloids (30fps 10000 frames). Track the particles. Measure the average area fraction of colloids.
- 3) Prepare additional samples each time taking a movie in the same conditions.  
Aim for a range of area fractions in the sample of  $\phi = [0.01 \ 0.45]$ .
- 4) Track all the movies you have collected.

#### ***Week 3:***

- 1) Calculate the ensemble average MSD and the time average MSD. Are they the same? What do you learn from that?
- 2) Extract the long time diffusion coefficient for each sample and plot it as a function of area fraction.
- 3) Does it fit the expected dependence? What could affect this result?
- 4) Add more experiments in area fractions according to need.

#### ***Week 4:***

- 1) Calculate the pair correlation function of all the samples.
- 2) In which concentration does the colloidal suspension behave like a gas and in which like a fluid?
- 3) Add more experiments in area fractions according to need.