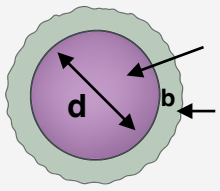
CAPCAP: Controlling Adhesion between Particles, for a better understanding of Compaction, Aeration and flow of powders. ?

M. Lajeunesse, F.M.Rocha, D. Dumont, V. Bertin, M. Nicolas, O. Pouliquen
IUSTI, CNRS, Aix-Marseille University, France

controlling adhesion:

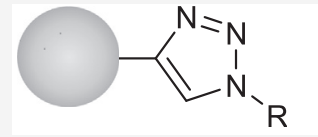
coated particles



Silica Microbeads
+PDMS-OH,
+Boric Acid (H_3BO_3)

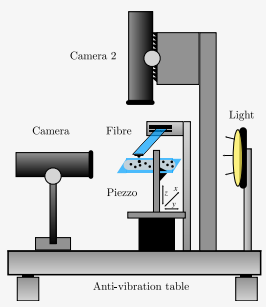
Tailored polymer micro-particles

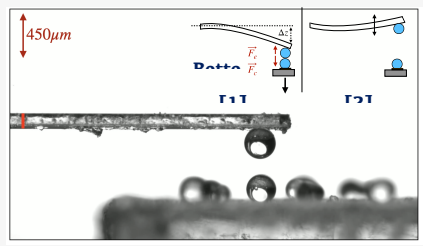
Eric Drockenmuller, Nathalie Sintes, Kishen Haumeer IMP, lyon



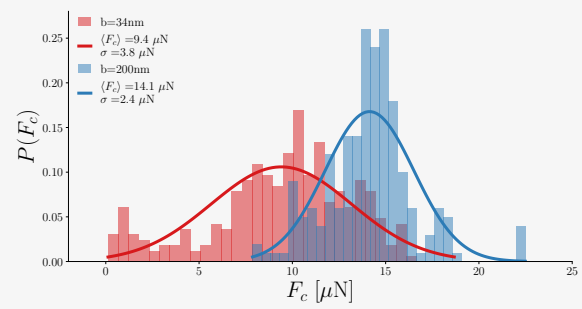
measuring adhesion

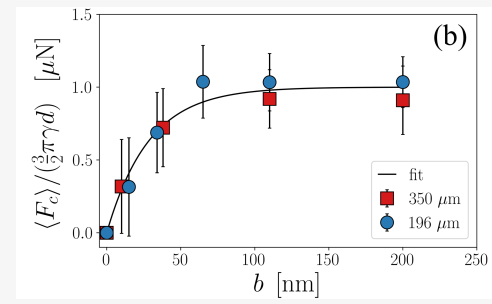
a home-made « macro AFM »





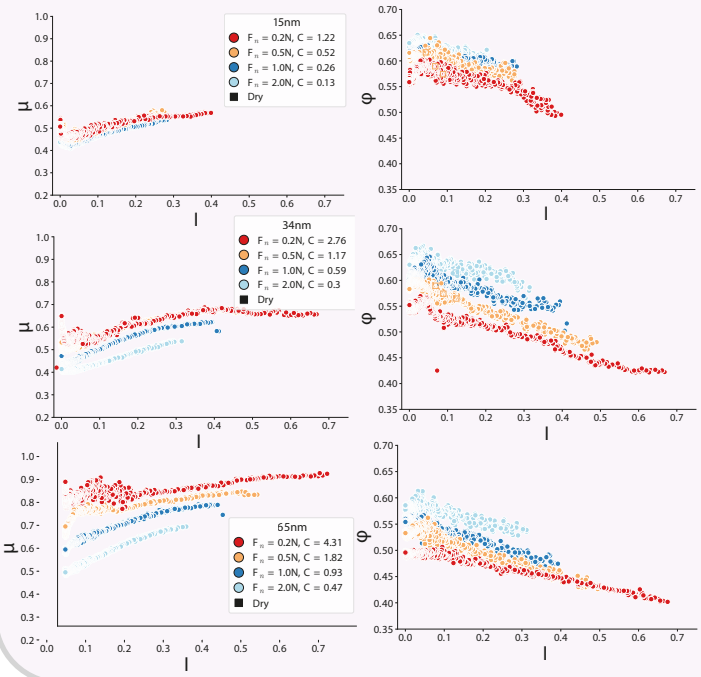
$$F_c(b) = \frac{3}{2}\pi\gamma d(1 - e^{-b/B})$$

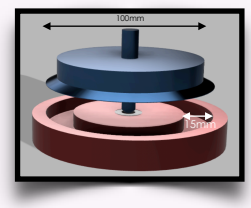


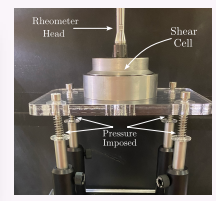


rheology under low confinement

inertial regime



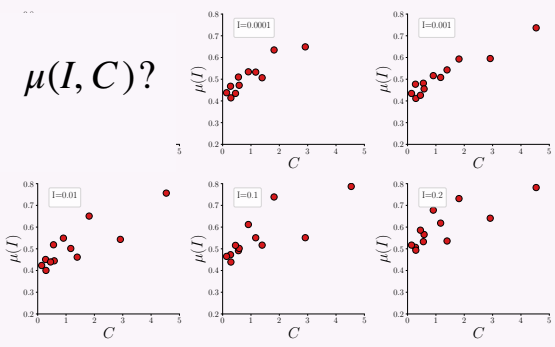




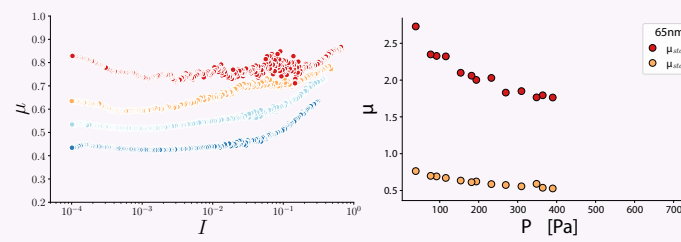
which control parameters ?

$$I = \frac{\dot{\gamma} d}{\sqrt{P/\rho}} \qquad C = \frac{F_c}{Pd^2}$$

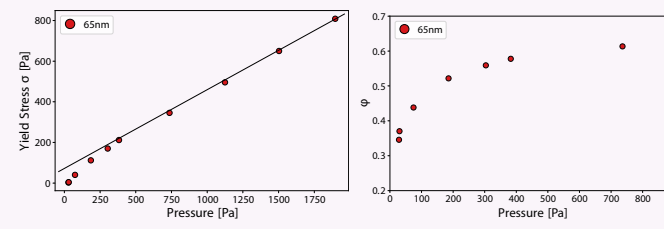
$\mu(I, C)$?



quasi static regime
(to be confirmed)



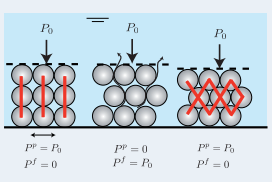
shear weakening and strong hysteresis



in the critical state: no cohesion at low pressure!

role of air in transient

liquefaction

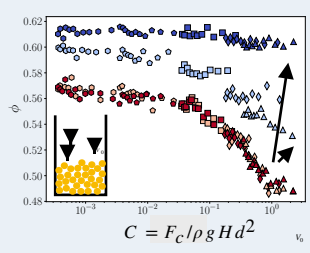


with powders

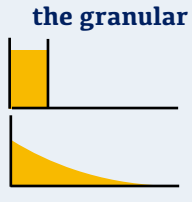
Small size:=> enhance air coupling
help instability

cohesion:=> add strength
attenuate instability
=>loose packing
help instability

1st step: preparation



the granular collapse



dynamics for different preparations ?
cohesion+air coupling ?

perspectives

Rheology :

-change materials, cohesion type,
-try to understand the other control parameters (adhesion energy?)
-find a way to analyse smaller particles (Toward type C)
-understand the link with other rheometers (rotating drum, FT4,..)

aeration/desaeration :

-collapse experiments with controlled fine material
to disentangle the role of auto-fluidisation and cohesion...

IUSTI LABORATOIRE AIX MARSEILLE UNIVERSITÉ CNRS
amU Aix Marseille Université
cnrs
CohPa erc