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# Gel Beads to Investigate Sedimentation

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David Leleu, Andreas Pfennig

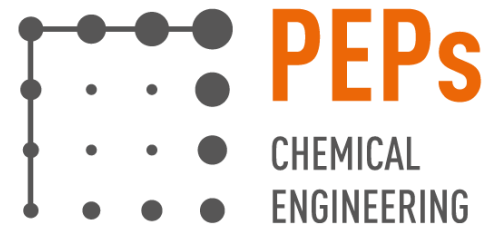
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Products, Environment, and Processes (PEPs)

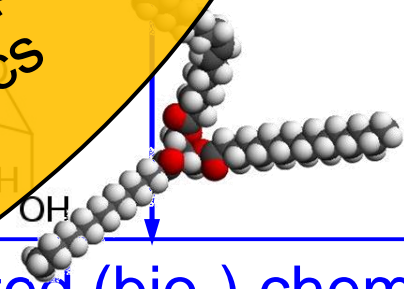
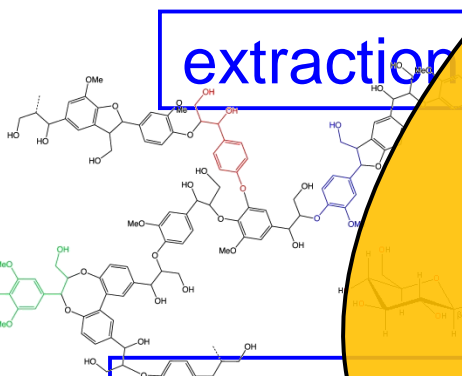
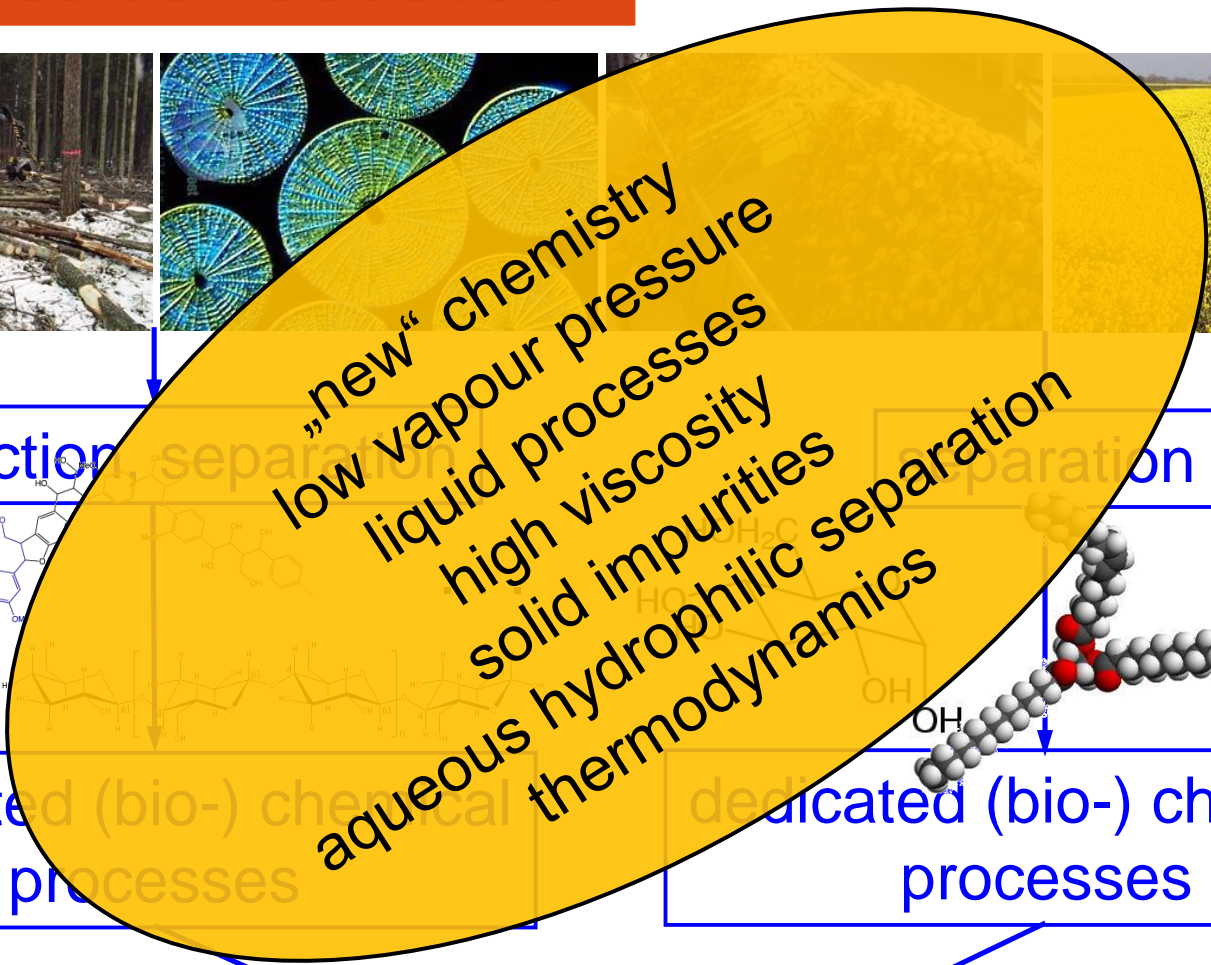
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Université de Liège

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# biomass as feedstock

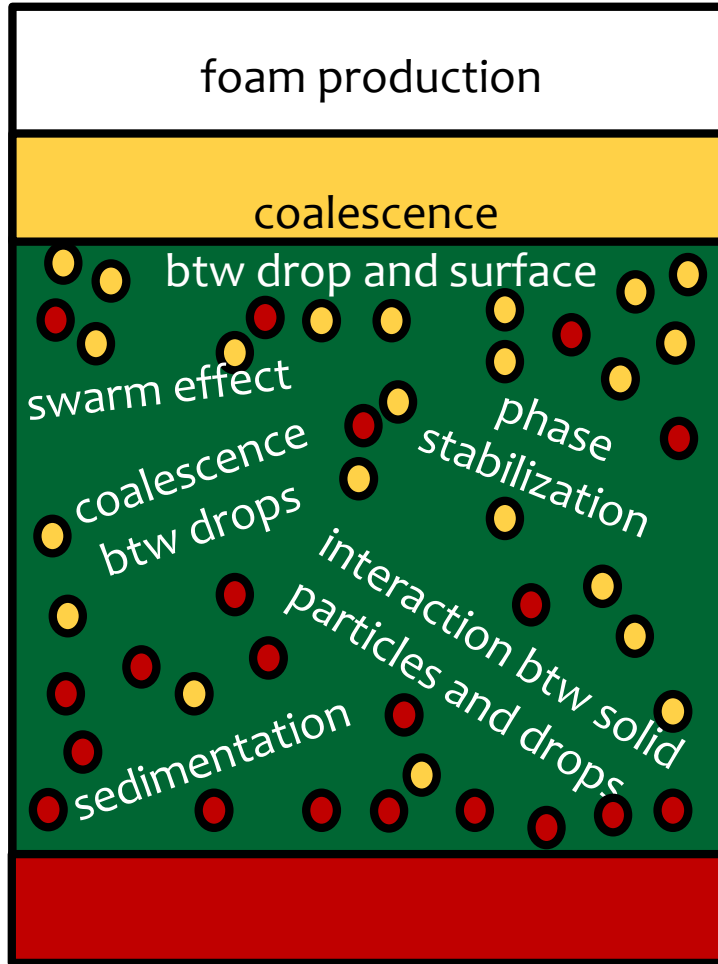


dedicated (bio-) chemical processes

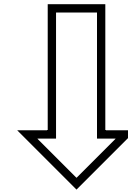
dedicated (bio-) chemical processes

new products  
strongly functionalized

# interaction of many phenomena

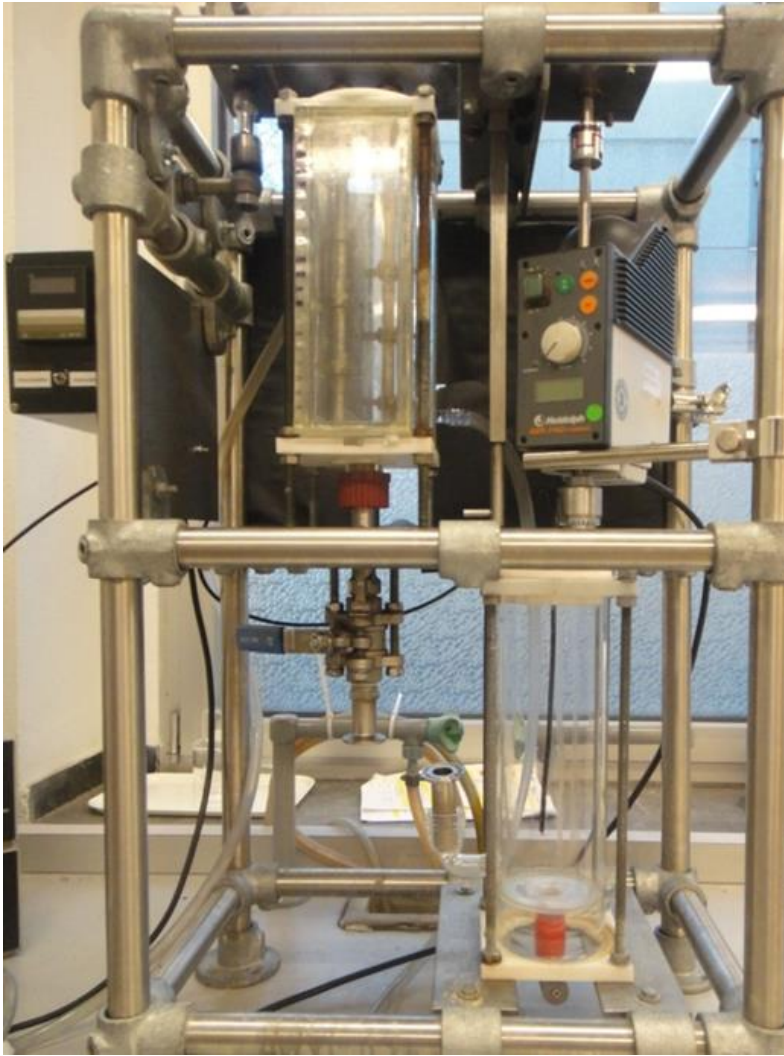


prediction of  
multiple phenomena

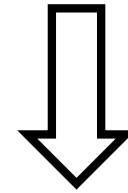


design of technical  
equipment

# standardized settling cell after Henschke

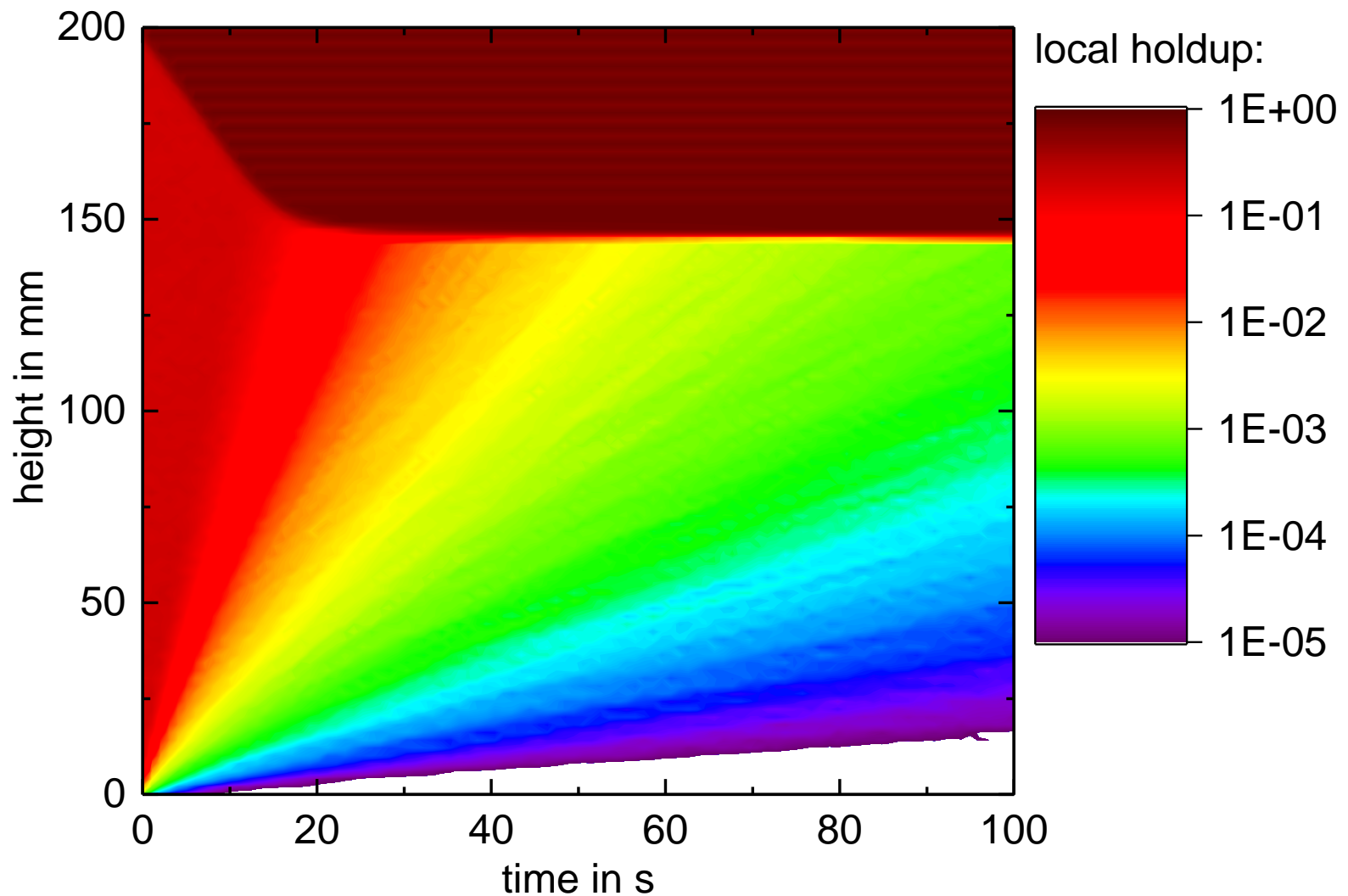


prediction of  
multiple phenomena



design of technical  
equipment

# evolution of a monodispersed system

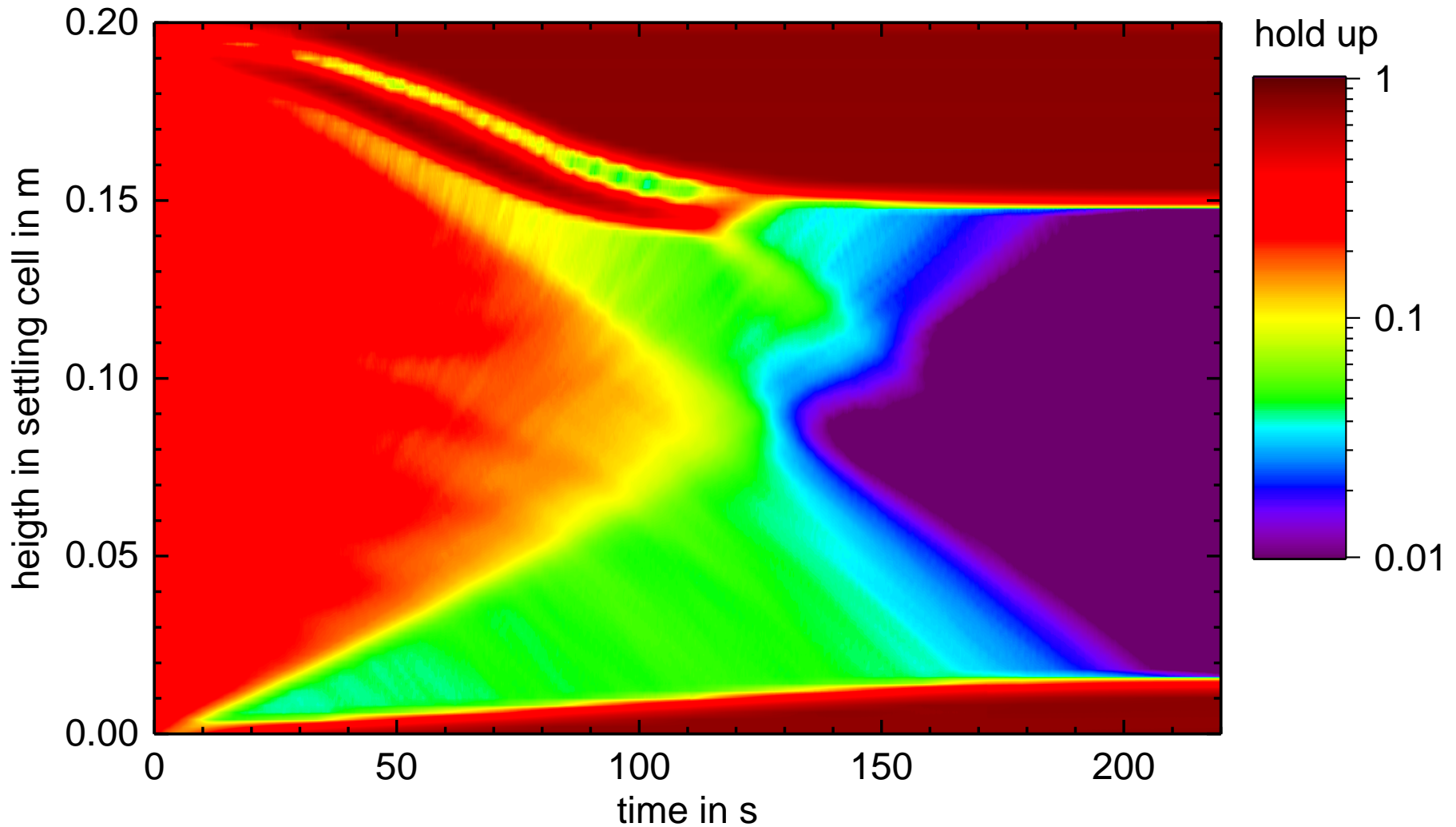


# modeling steps

- single-drop velocity
- swarm effect
- multiphase system
- polydispersity effect
- coalescence



# simulated evolution of bidispersed system

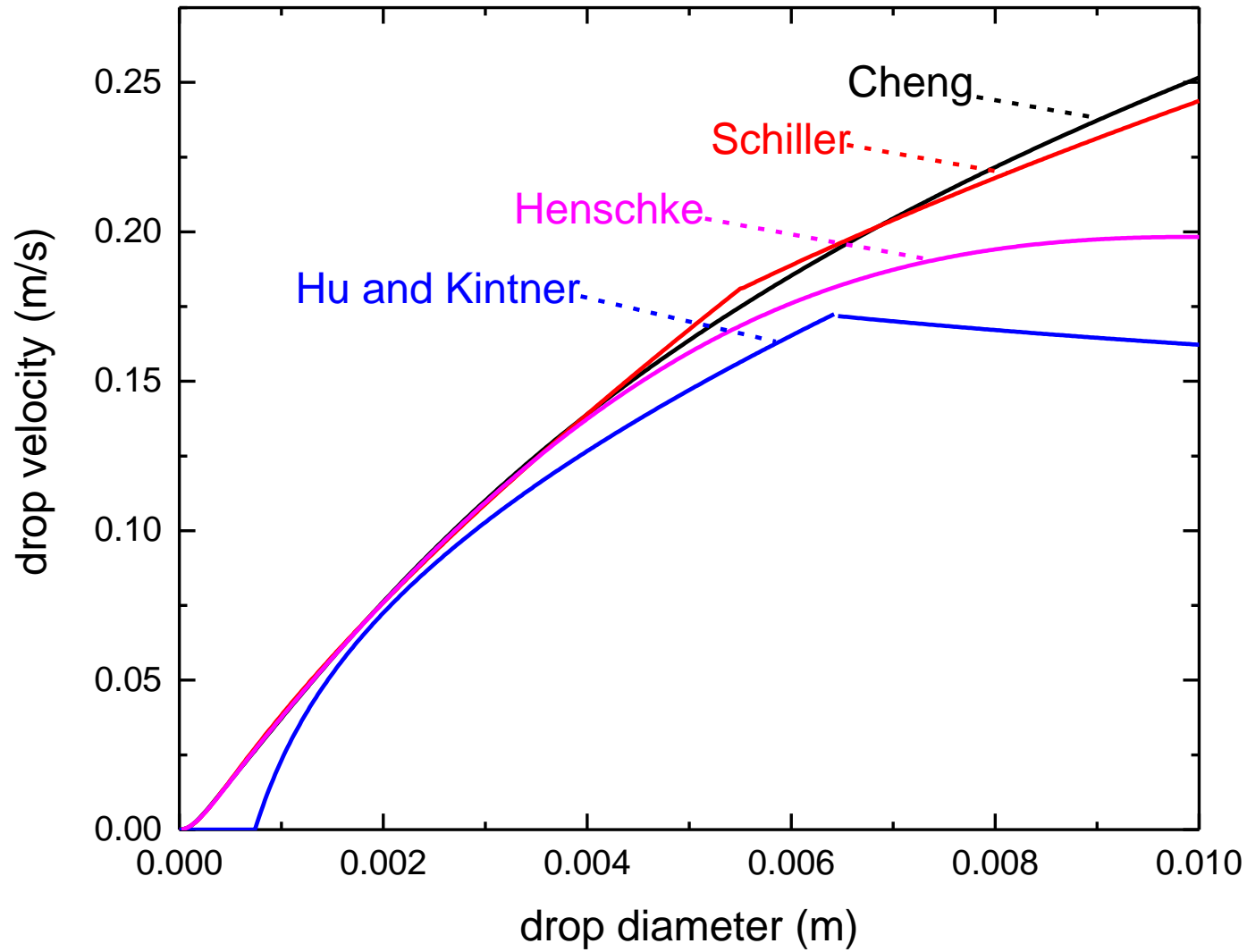


# modeling steps

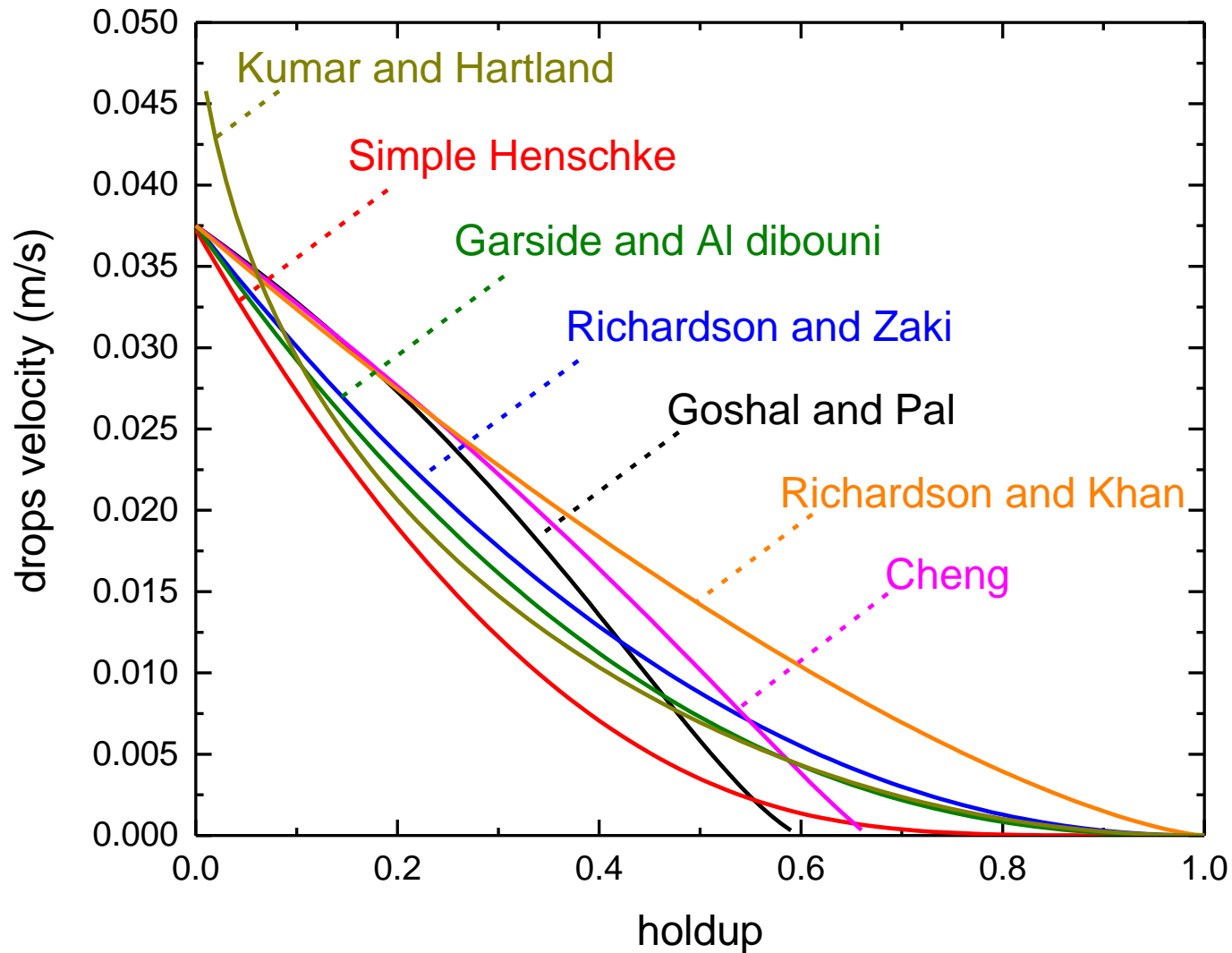
- single-drop velocity
- swarm effect
- multiphase system
- polydispersity effect
- coalescence



# single-drop velocity models



# swarm models for 1 mm drops



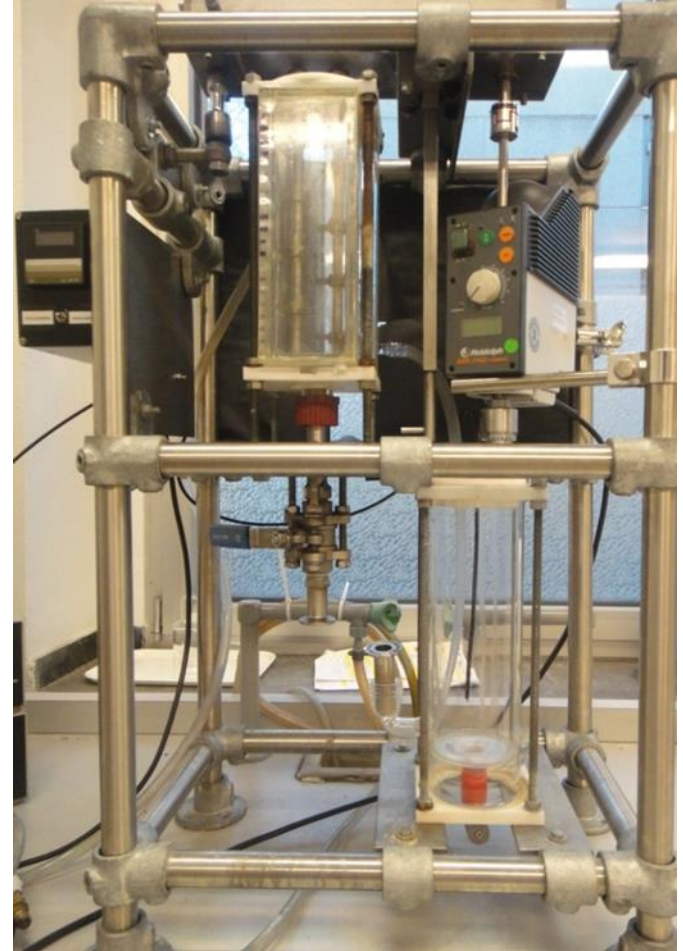
# mobile interface challenge

- liquid-liquid dispersion
  - broad, variable, unknown drop size distribution
  - parallel phenomena occurring at the same time



use of alginate gel beads

- rigid interface
- properties easy to define

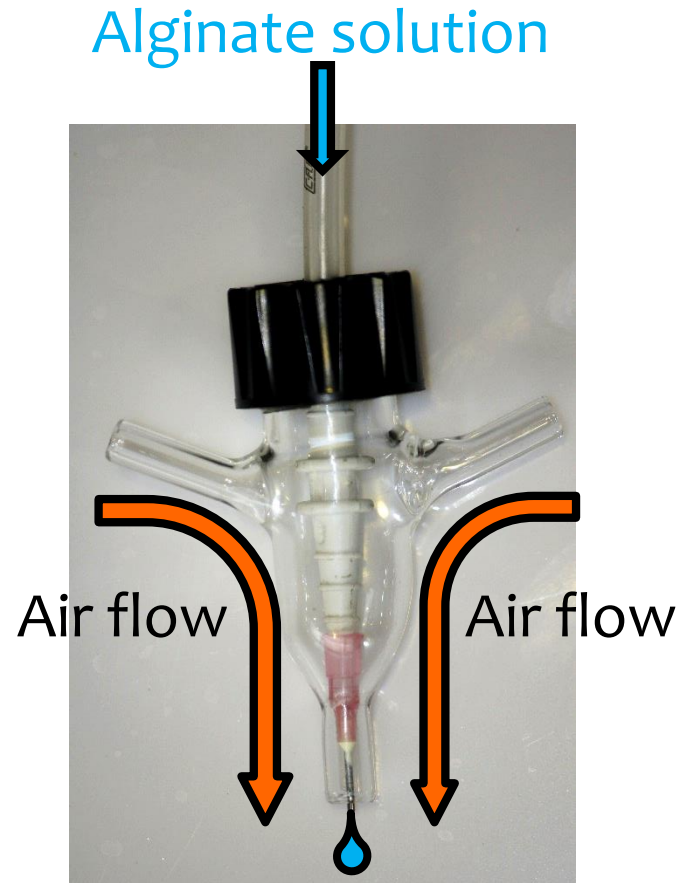
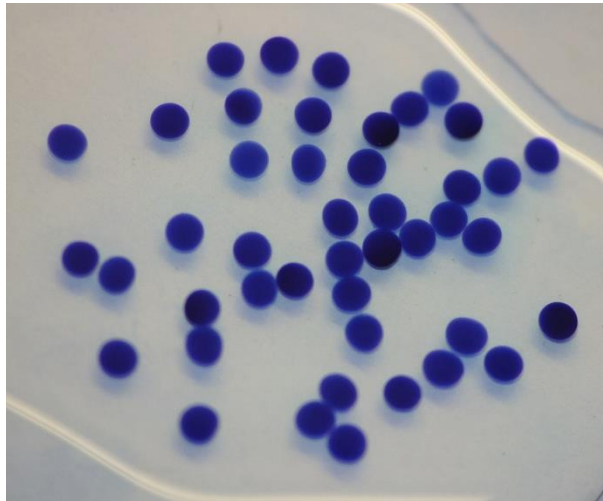


# alginate beads production

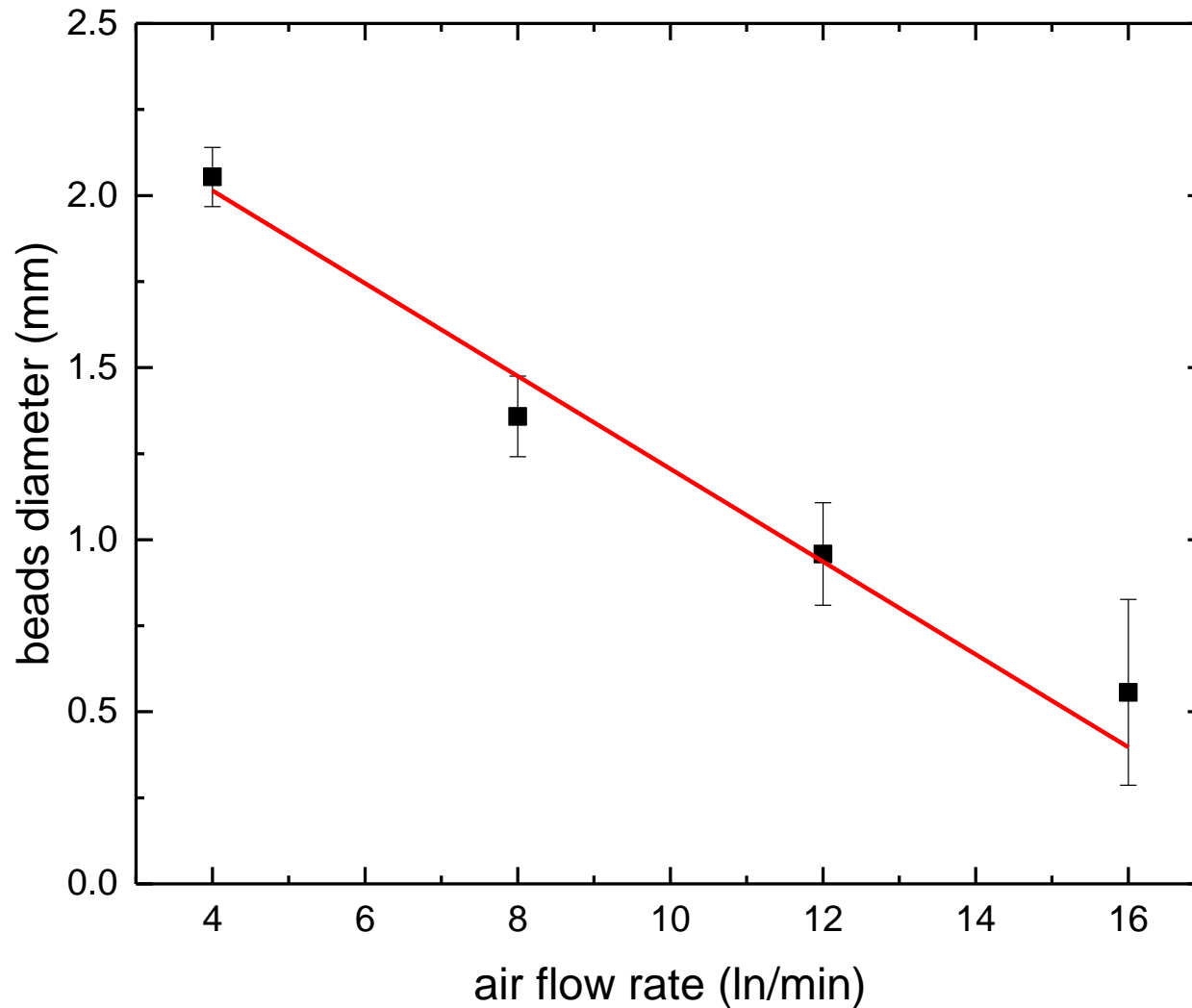
size  $\longleftrightarrow$  air flow

correlation

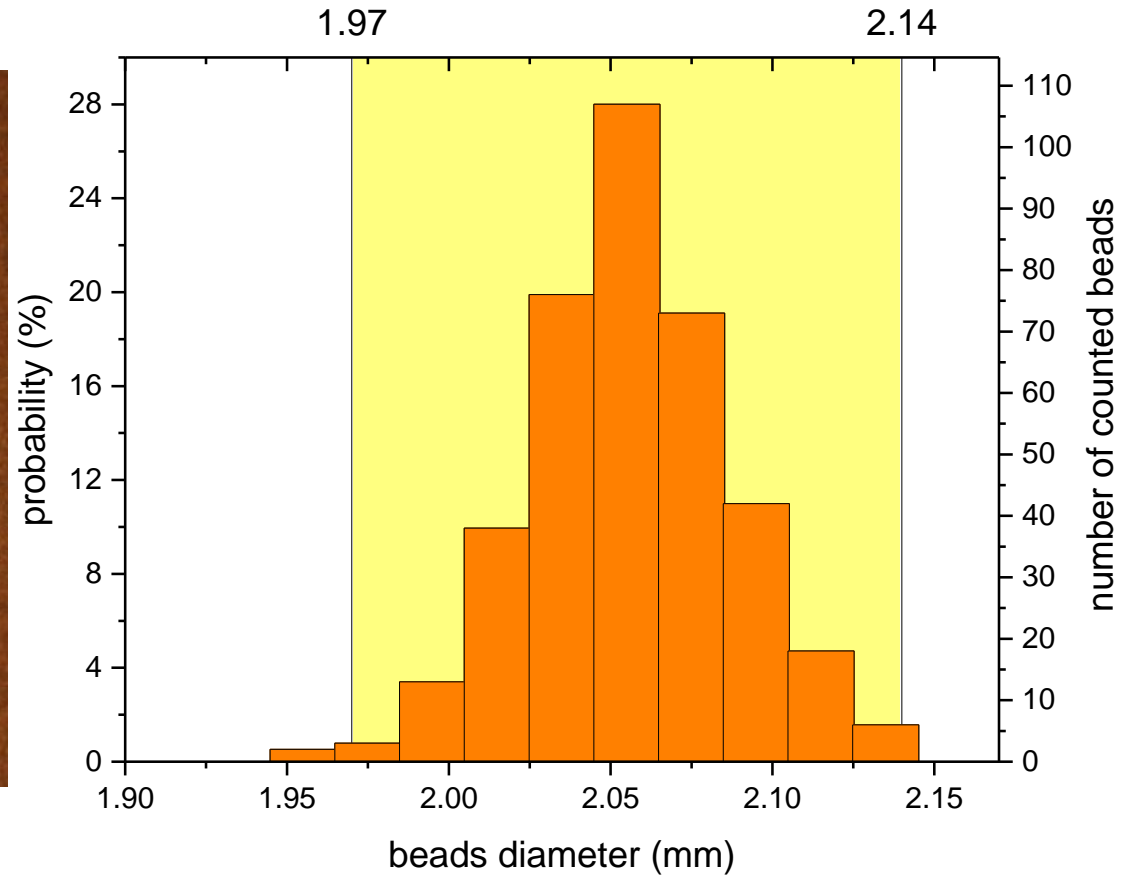
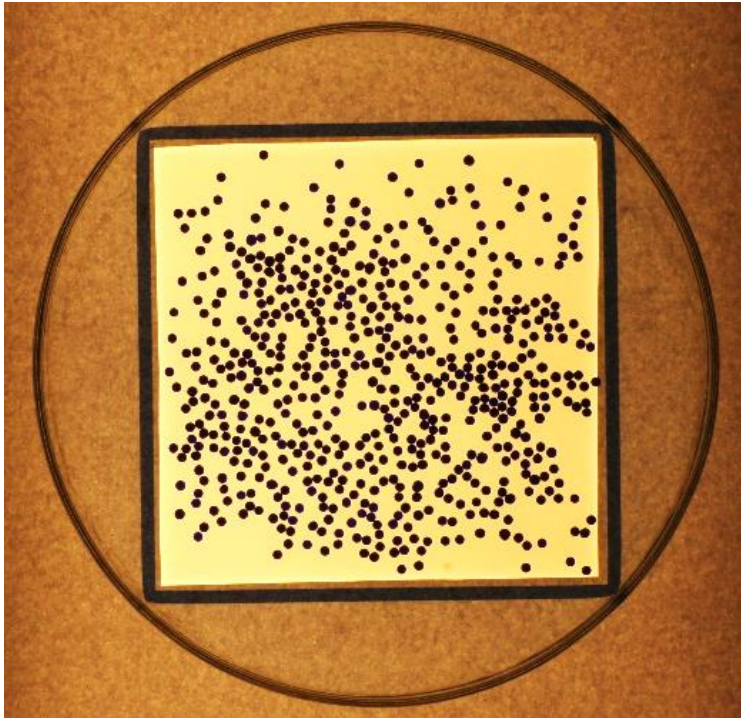
beads density  $\longleftrightarrow$  added compound



# diameter evolution with the air flow

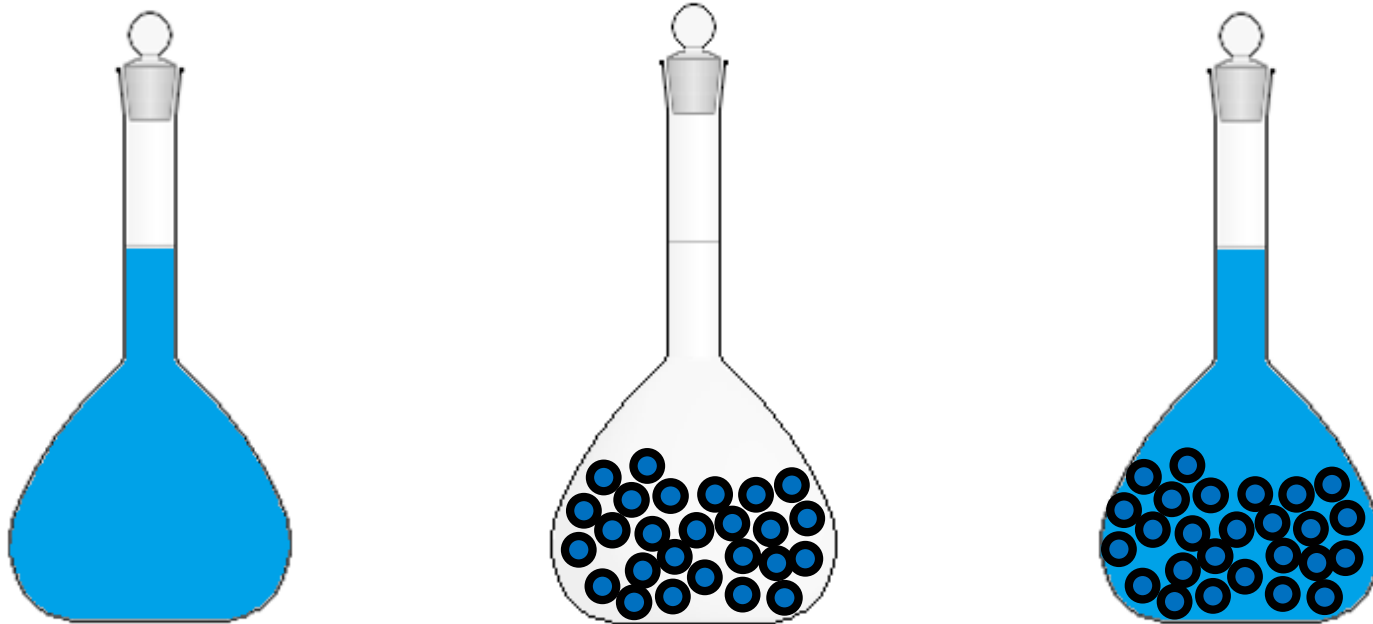


# size distribution characterisation



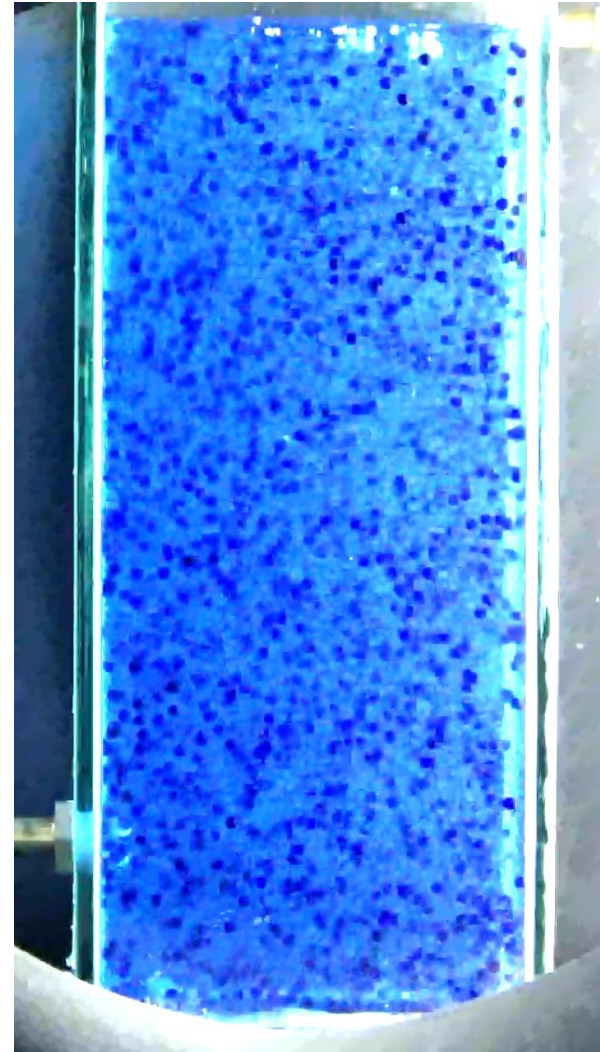
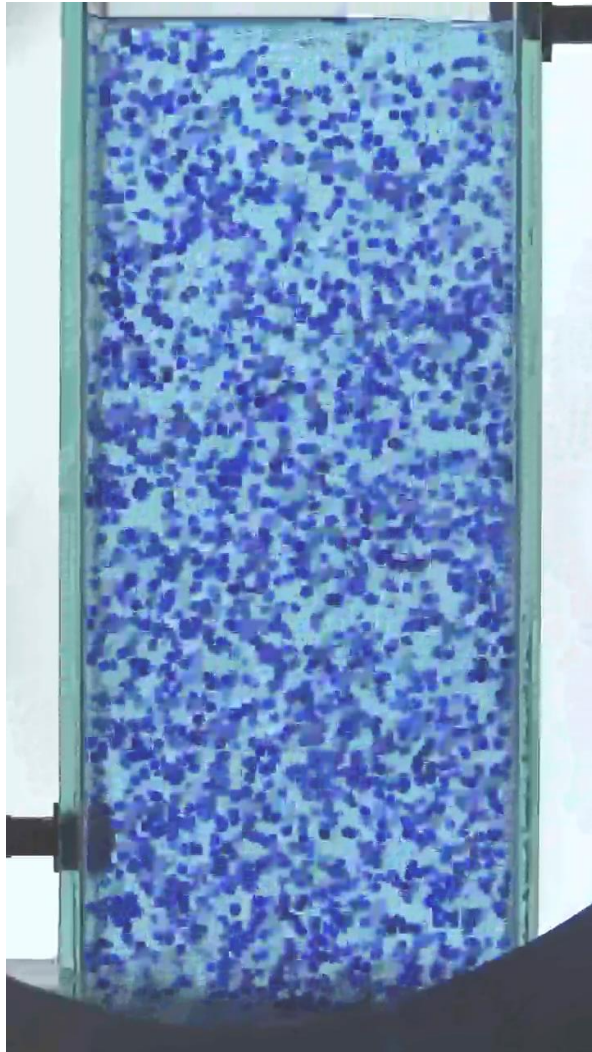
# density measurement

■ beads density =  $\frac{\text{weight of beads}}{\text{volume}_{\text{flask}} - \text{volume}_{\text{added water}}}$





# sedimentation experiment



# summary

- validated standardized settling cell
- numerical tool to design technical equipment
- DSD and multiphase option added to that tool
- experimental validation of sedimentation models
- alginate gel beads to focus on the sedimentation phenomenon

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