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Standardized Settling Cell to Characterize Liquid-Liquid Dispersion

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agenda

- motivation
- settling cells
  - description
  - evaluation methods
  - comparison
- conclusion

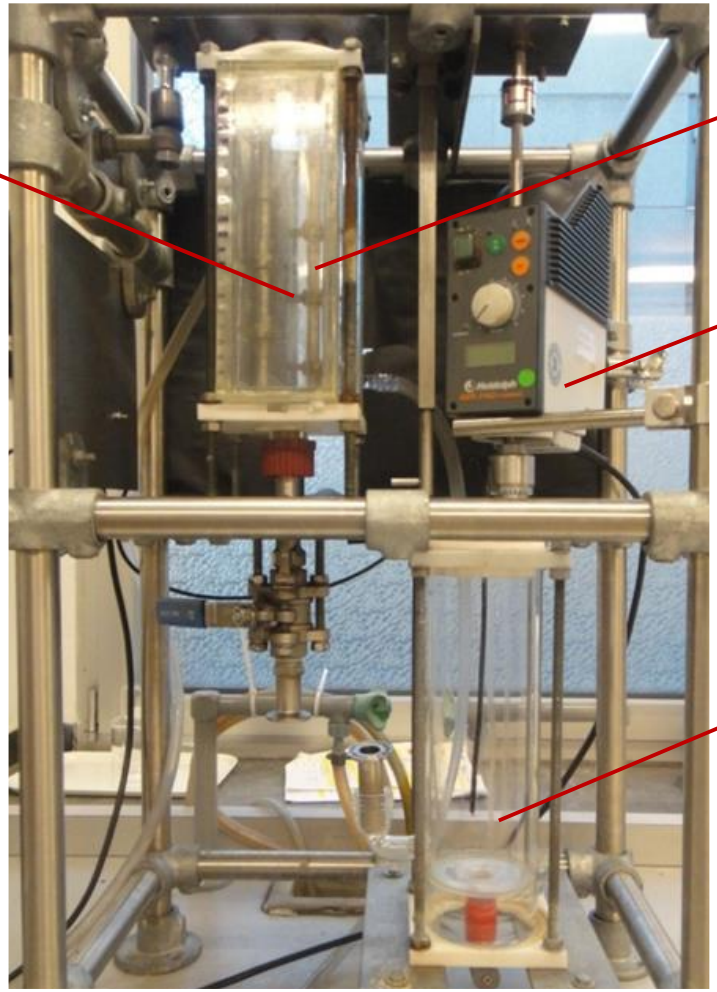
ERICAA project: design large gravity settler

partners:

Bayer Technology Services, Franken Filtertechnik, SOPAT, Normag, LANXESS Deutchland, Raschig, INEOS Phenol, Linde, Covestro,
TU Berlin, TU Kaiserslautern, University of Liège

stirring cell

double-wall
glass vessel



2 counter-rotating
shafts

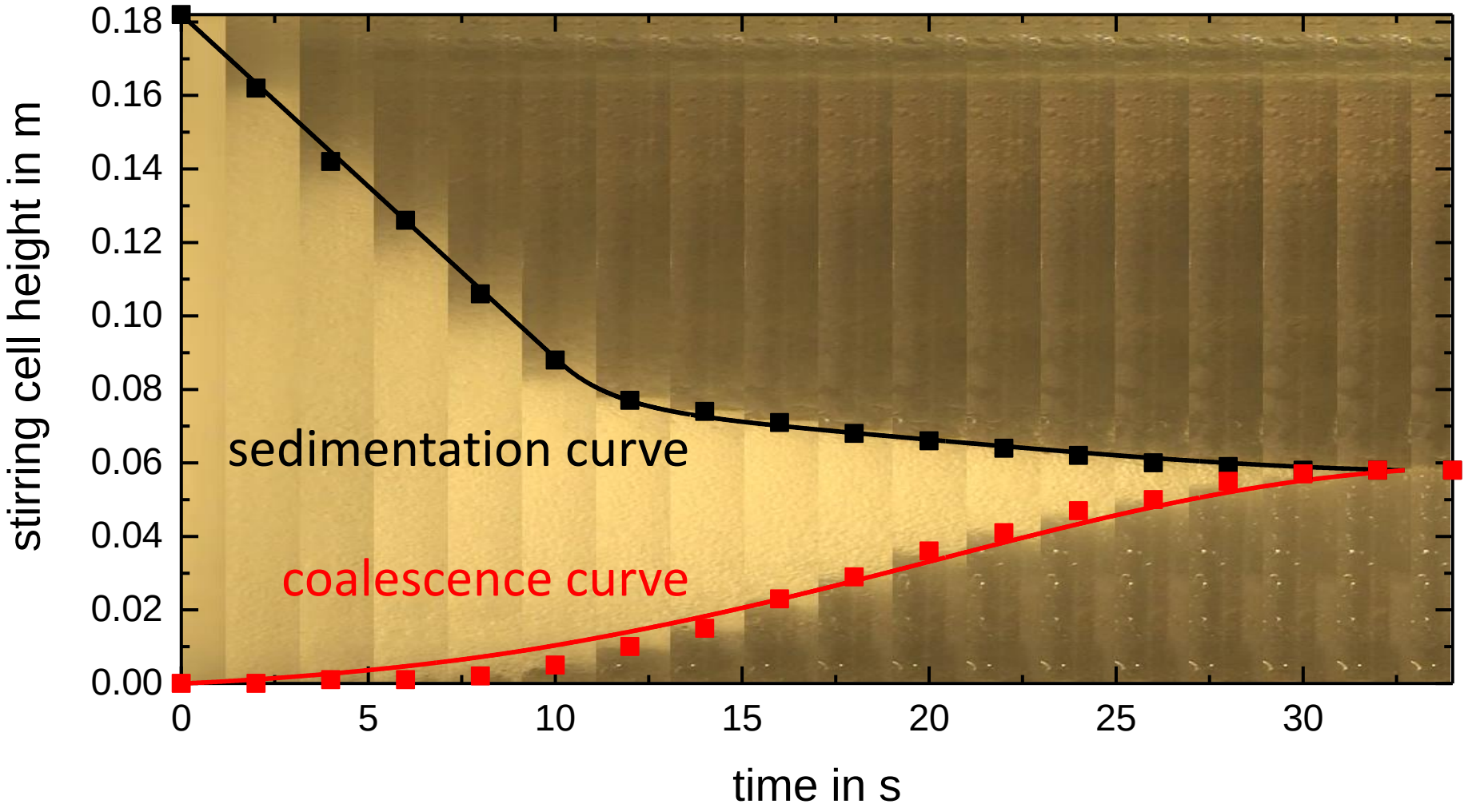
engine

second vessel
for internals

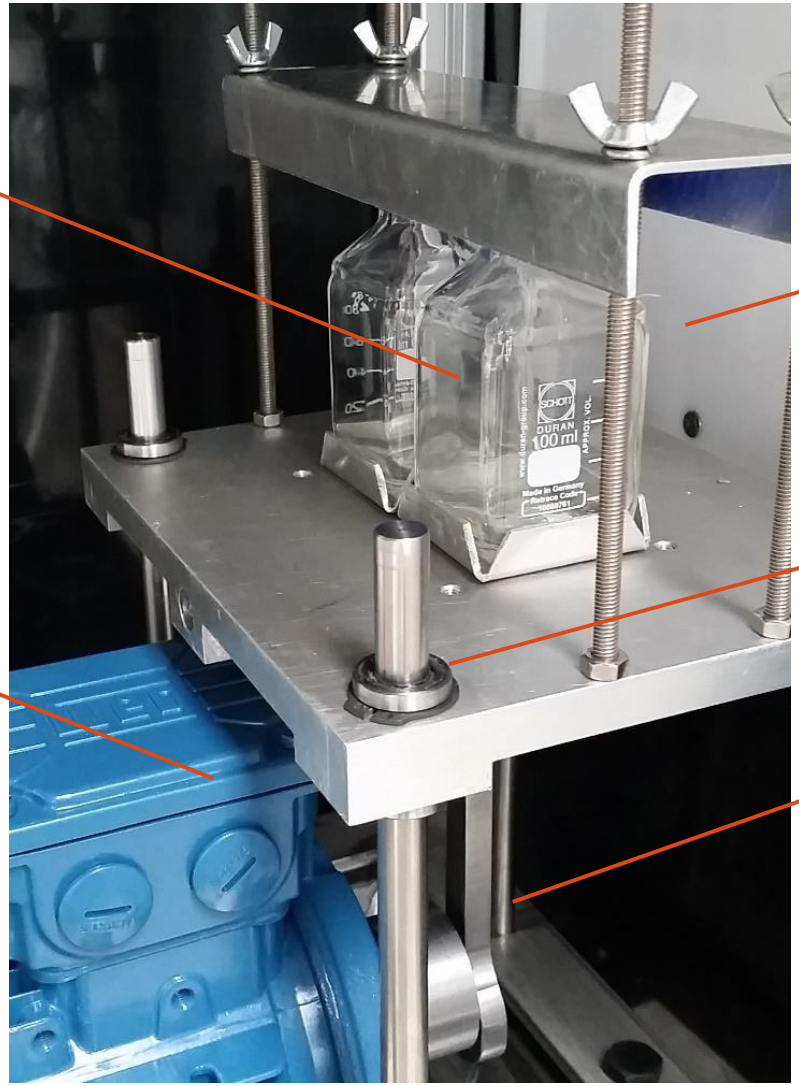
M. Henschke, L.H. Schlieper, A. Pfennig, *Chem Eng. J.*, **85**, 369-378 (2002).

stirring-cell experiment

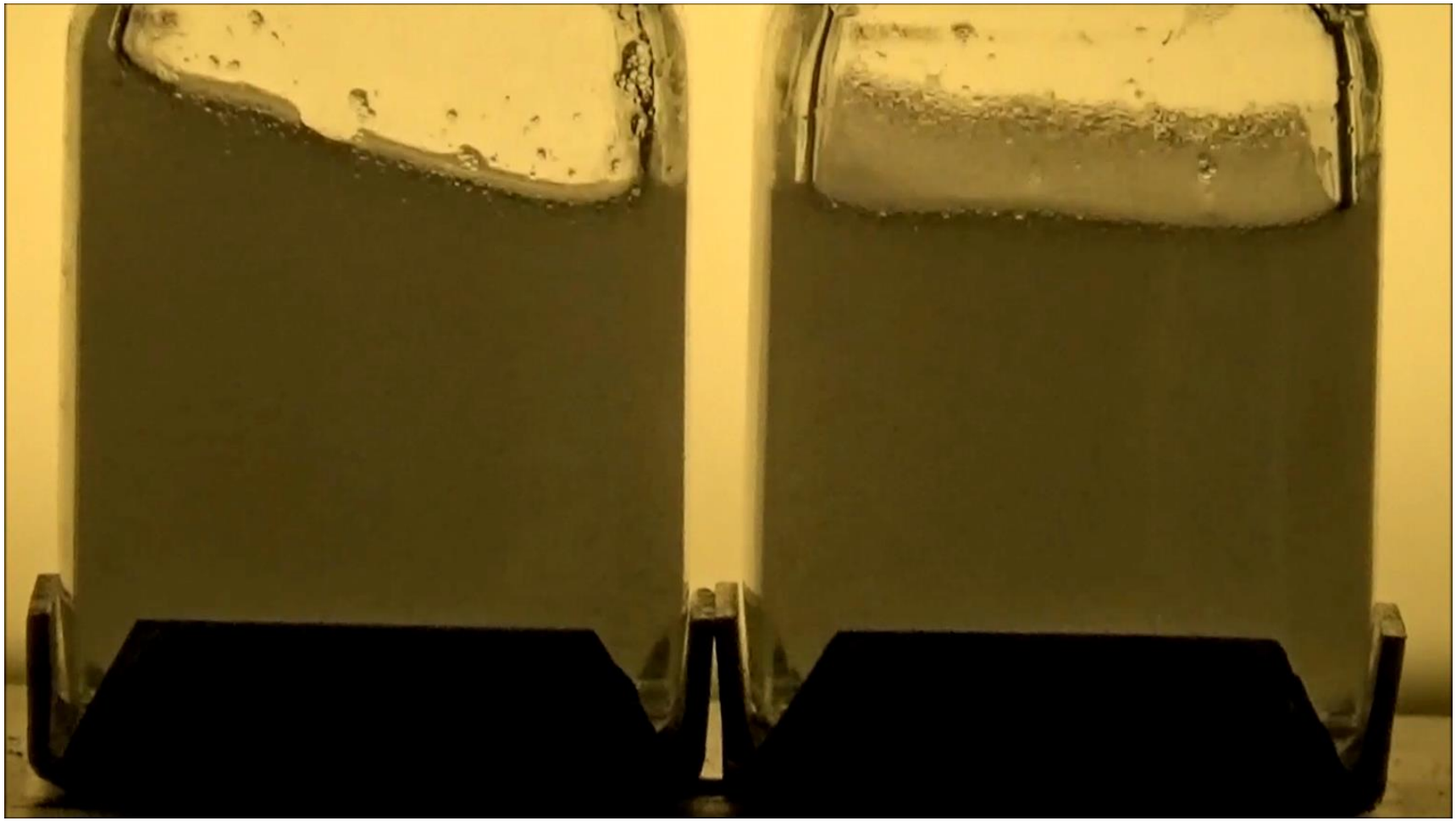
dispersion characterization



shaking cell



shaking-cell experiment



speed-up factor: 2

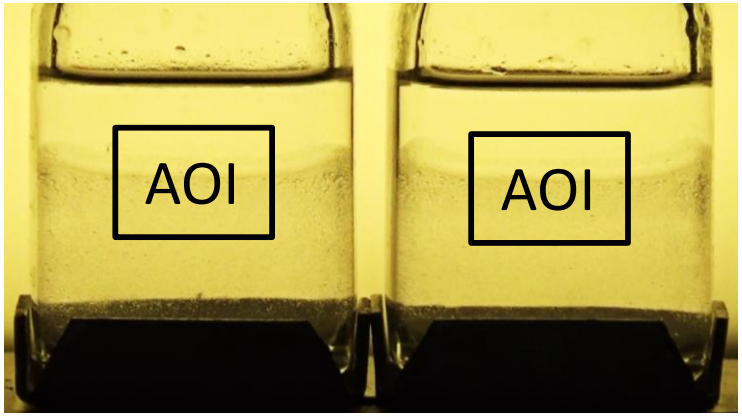
settling-time evaluation methods

- visual method

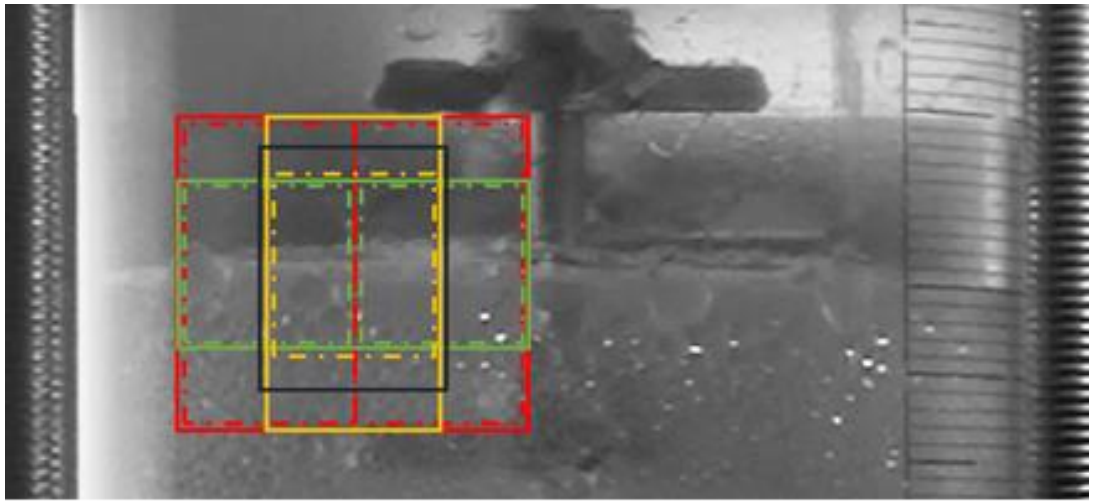
  settling time reached when the half of the interface is covered by a monolayer of drops

- numerical method

  grey-scale analysis to determine the settling time

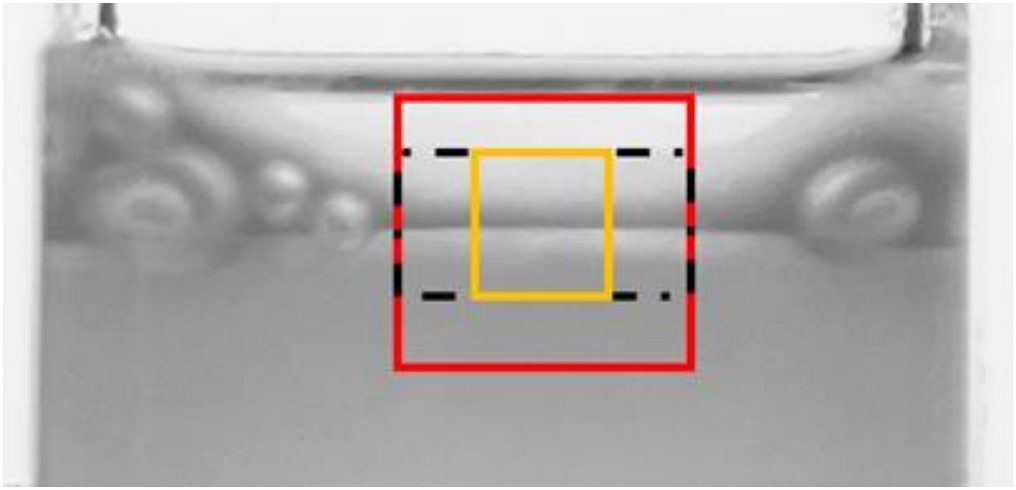


settling-time evaluation, stirring cell



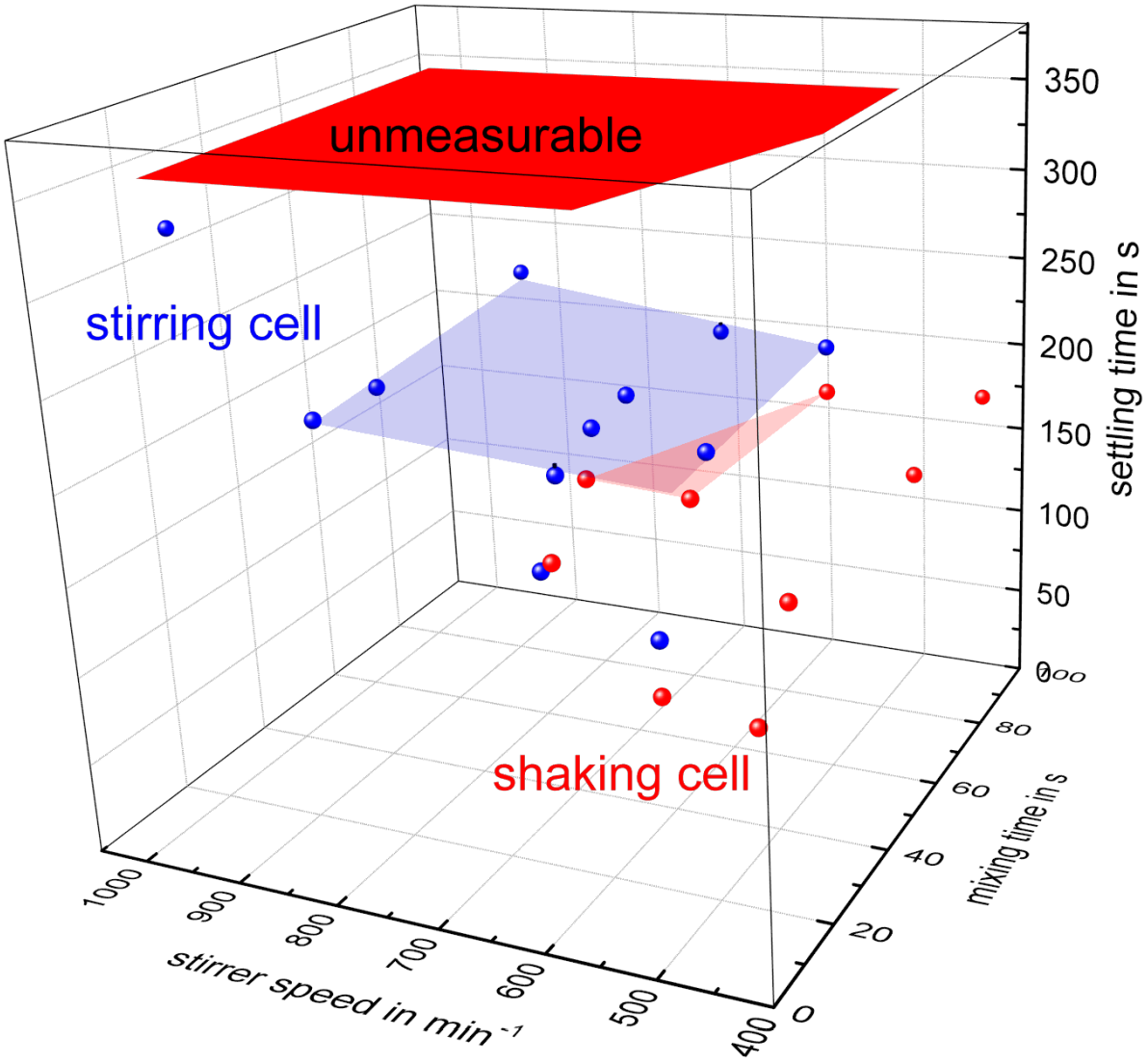
numerical method	settling time
different areas of interest (AOI)	63 to 74 s
different thresholds	64 to 71 s
visual method	70 to 77 s

settling-time evaluation, shaking cell



numerical method	settling time
different areas of interest (AOI)	196 to 200 s
different thresholds	196 to 207 s
visual method	120 s

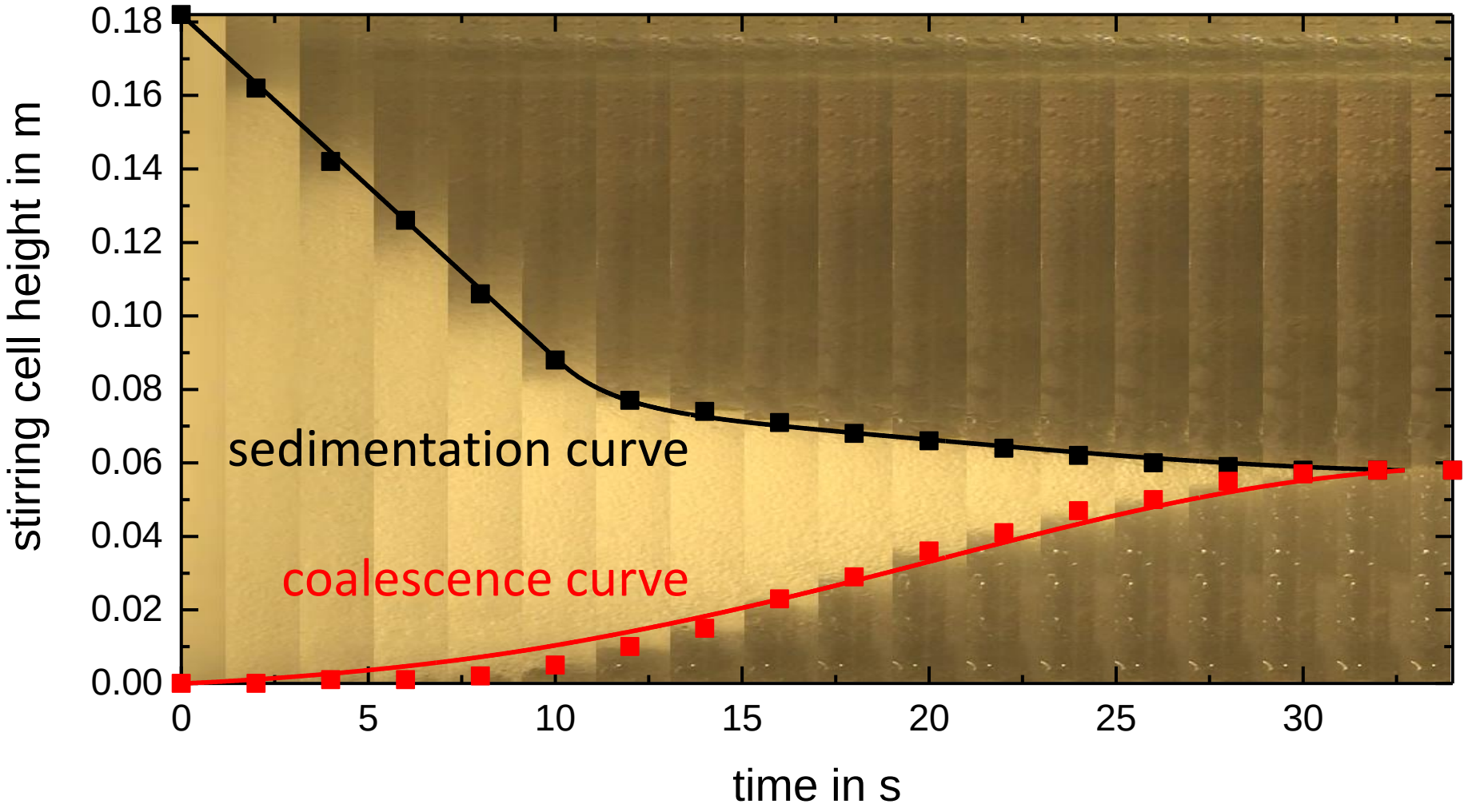
stirrer speed and mixing time effect



comparison of the two equipment's

	cells	
	stirring	shaking
mixing time & stirrer speed	++	-
temperature control	++	-
filling-height influence	++	++
air exchange	++	-
evaluation of settling curves	++	+
dependence of AOI and thresholds	++	++
	settling-time evaluation	
	visual	numerical
wall effect	++	-
automatically evaluated	-	++

dispersion characterization



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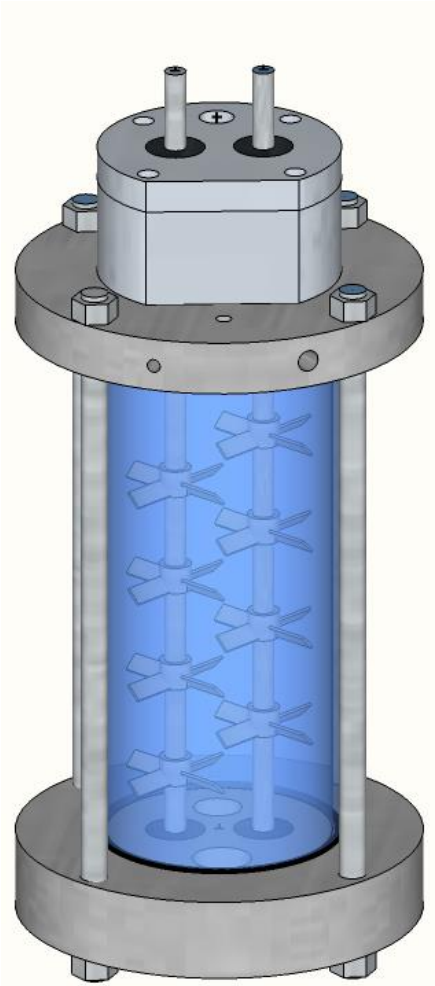
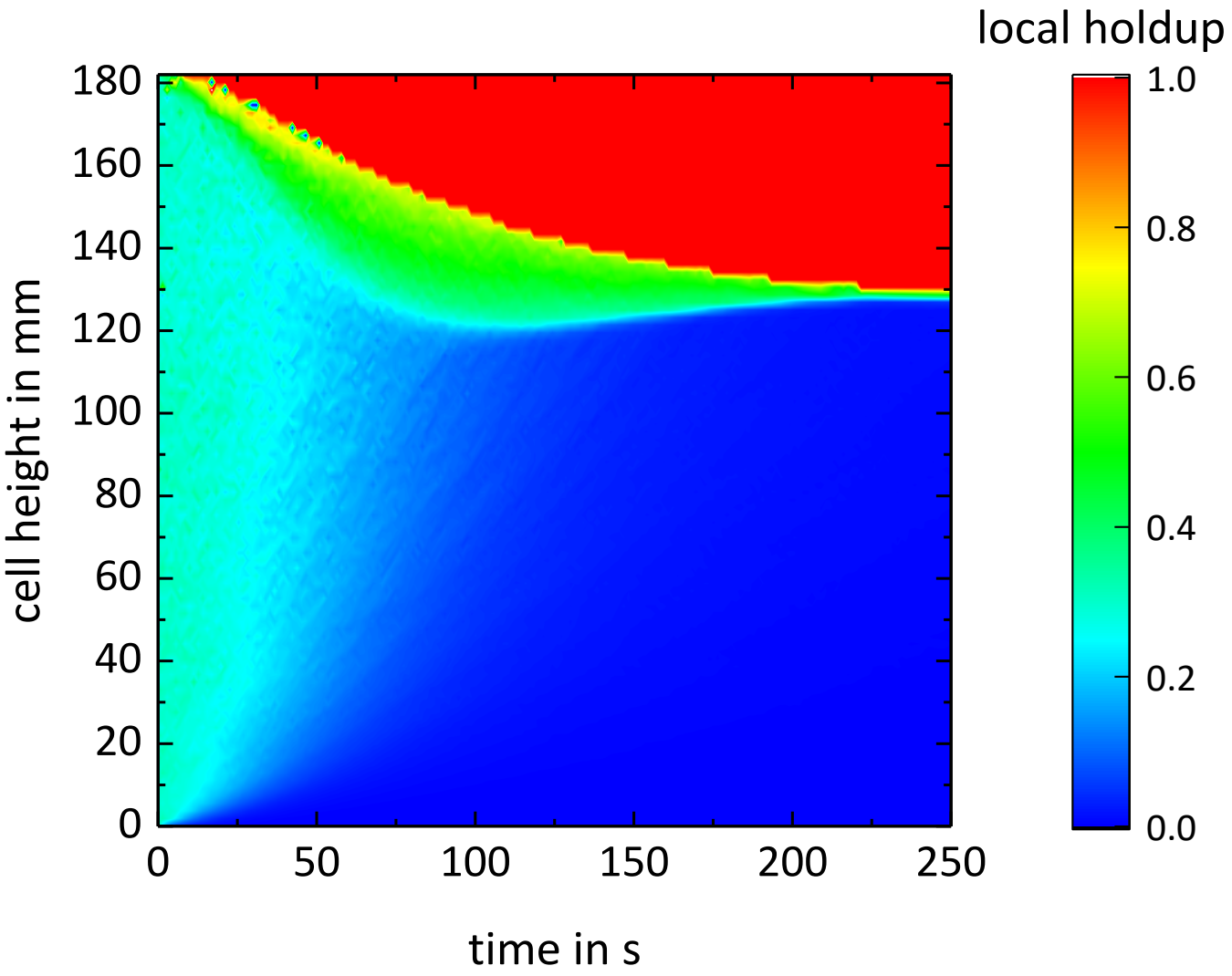
dependence of AOI and thresholds	++	++
	settling-time evaluation	
	visual	numerical
wall effect	++	-
automatically evaluated	-	++

optimal choice and summary

- stirring cell preferred:
  - more independent of the operational conditions
  - easy temperature control
- visual method to determine the settling time
- numerical evaluation of the settling and coalescence curves



simulation of a settling experiment



additional information

- poster 17: Considering polydispersity and new coalescence models in the description of separators
- youtube expert courses on solvent extraction

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