

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

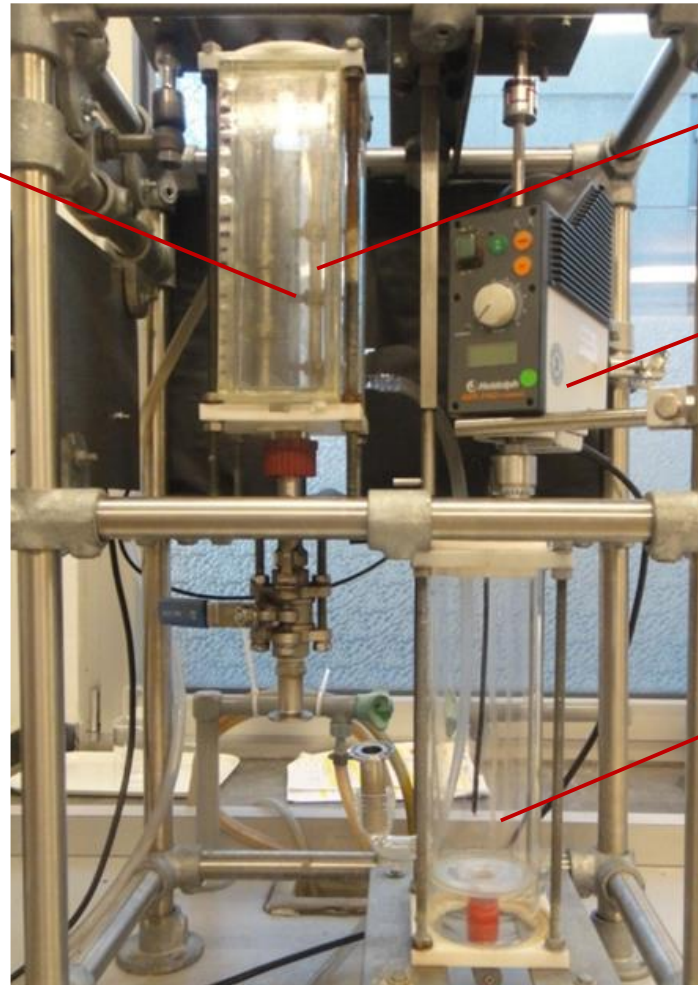


partners:

Bayer Technology Services, Franken Filtertechnik, SOPAT, Normag, LANXESS Deutschland, 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

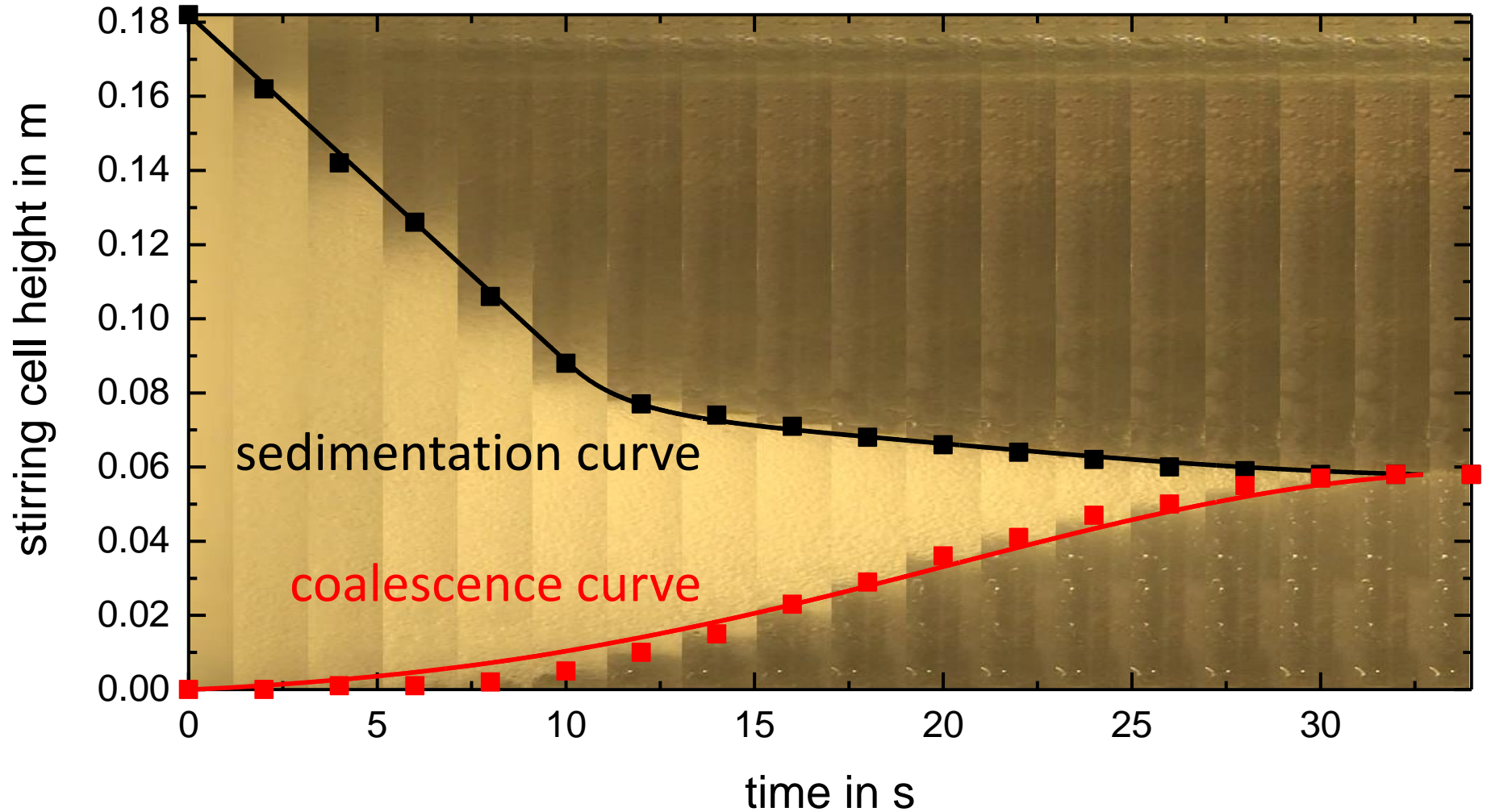
Henschke settling cell

Henschke, Chem Eng. J., 2002

stirring-cell experiment



dispersion characterization



shaking cell

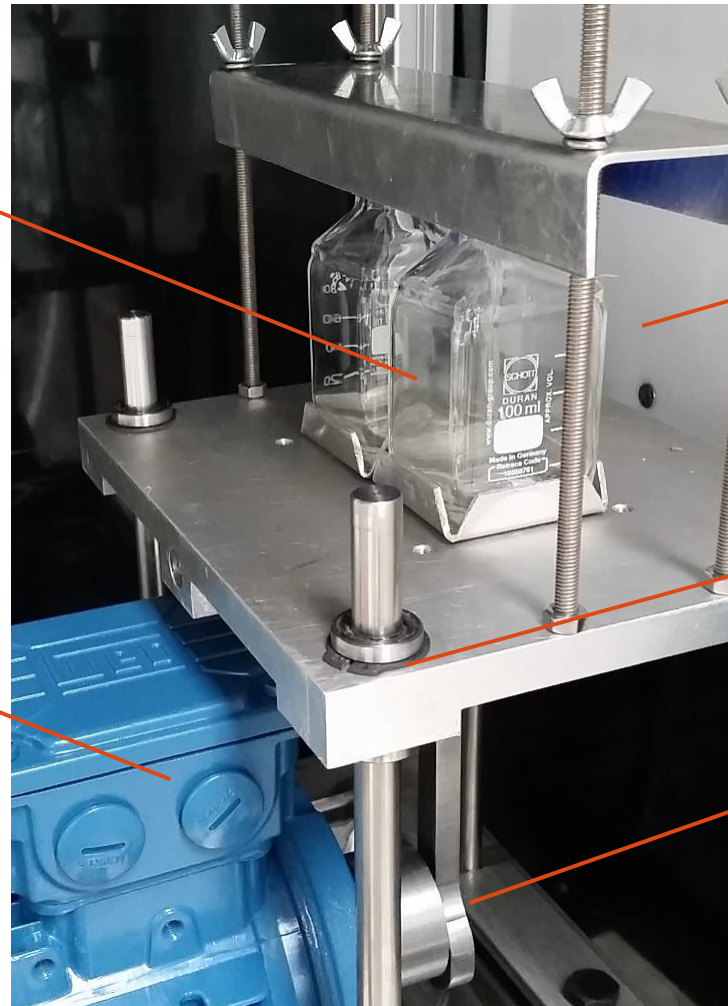
bottles

light

linear ball bearing

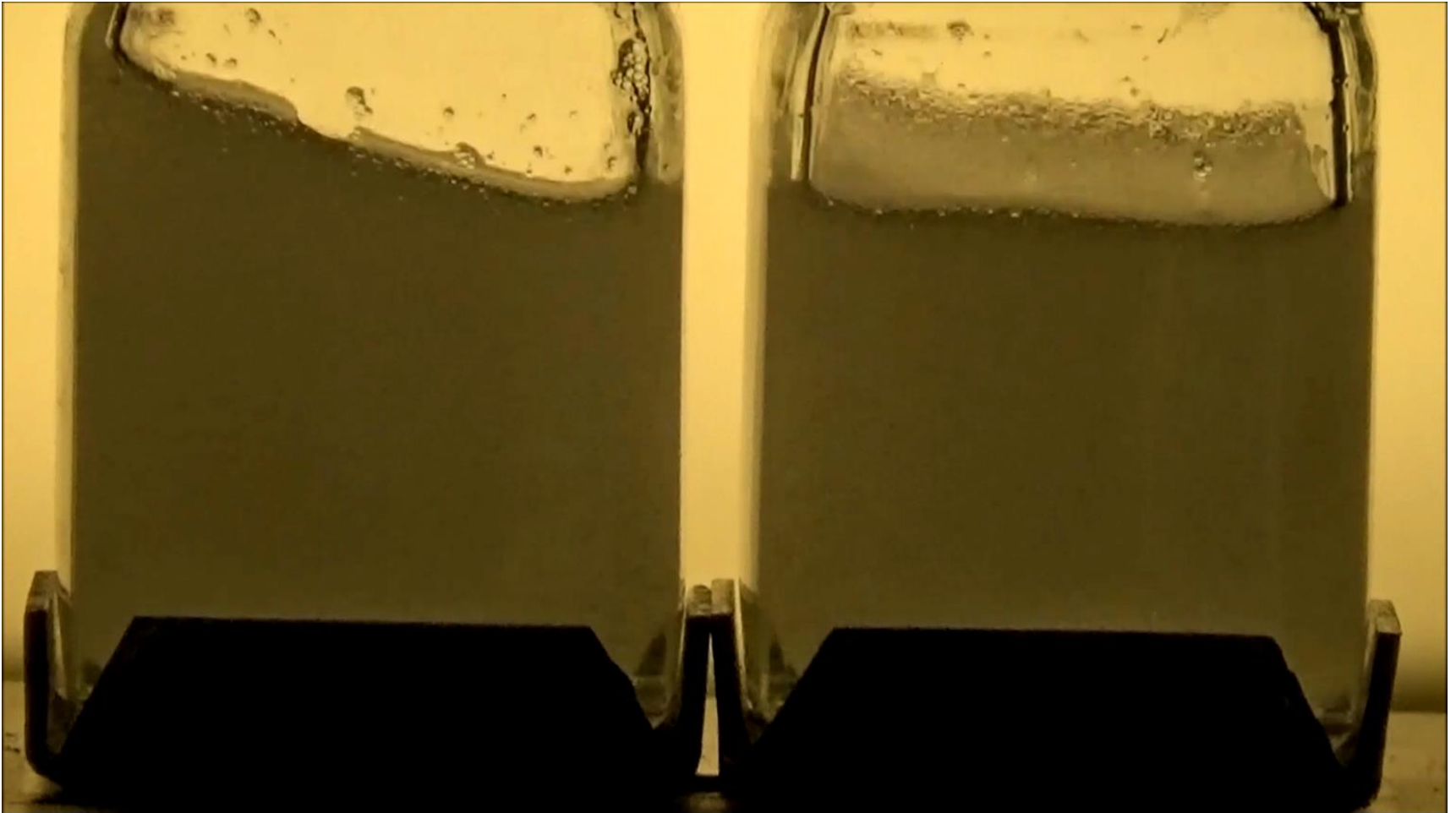
engine

crank



shaking settling cell

shaking-cell experiment



speed-up factor: 2

settling-time evaluation methods

- visual method

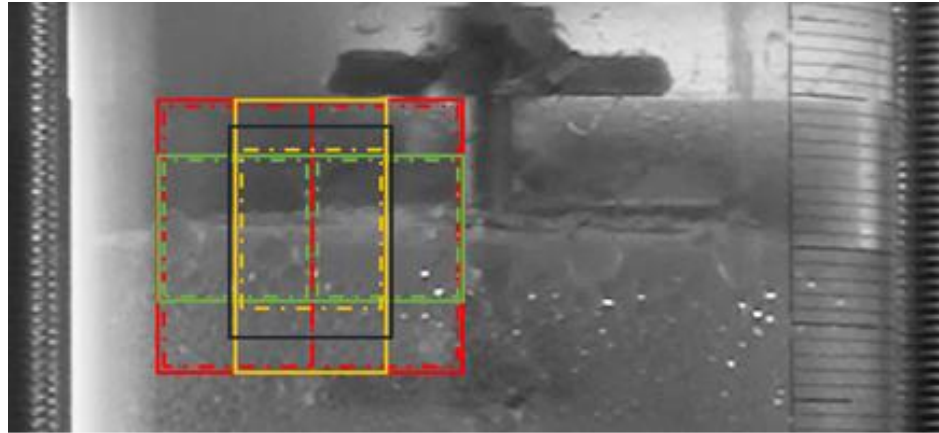
settling time reached when the half of the interface is covered by a monolayer of drops

- numerical method

grey-scale analysis to determine the settling time

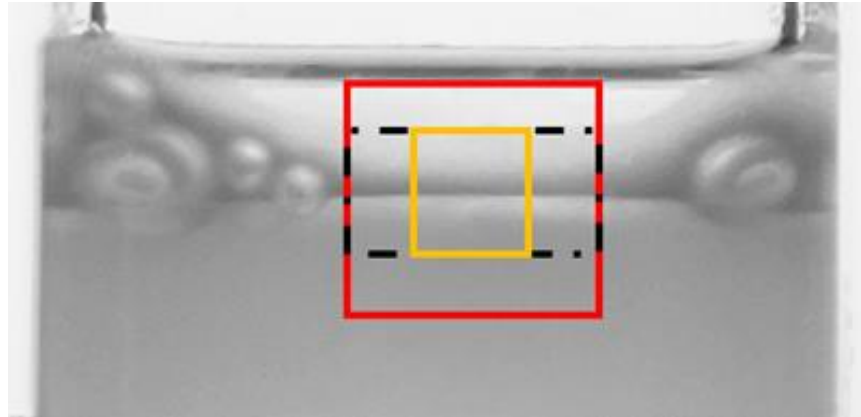


settling-time evaluation, stirring cell



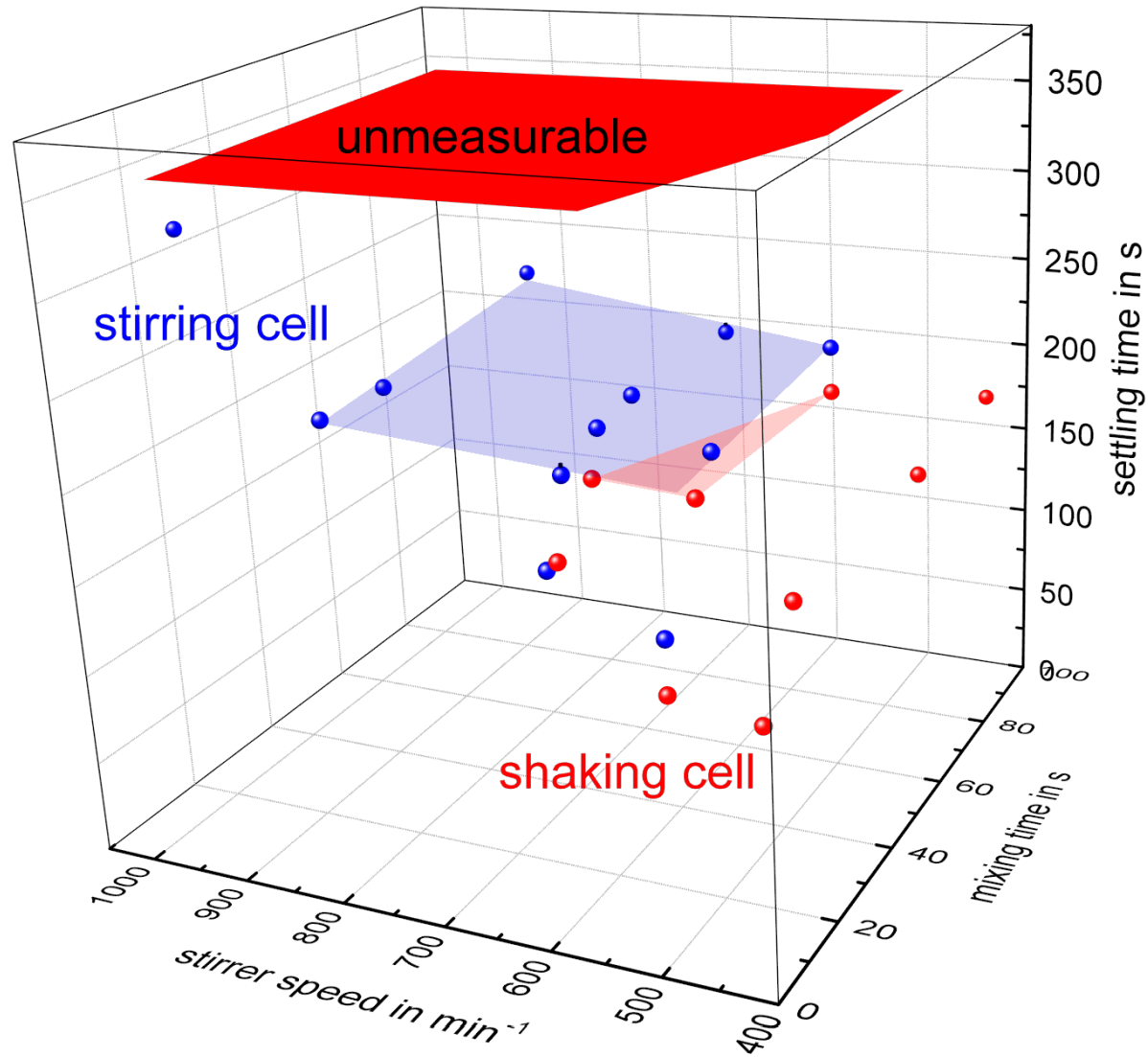
numerical method	settling time
different areas of interest (AOI)	63 to 74 s
different thresholds	64 to 71 s
visual method	70 to 77 s

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

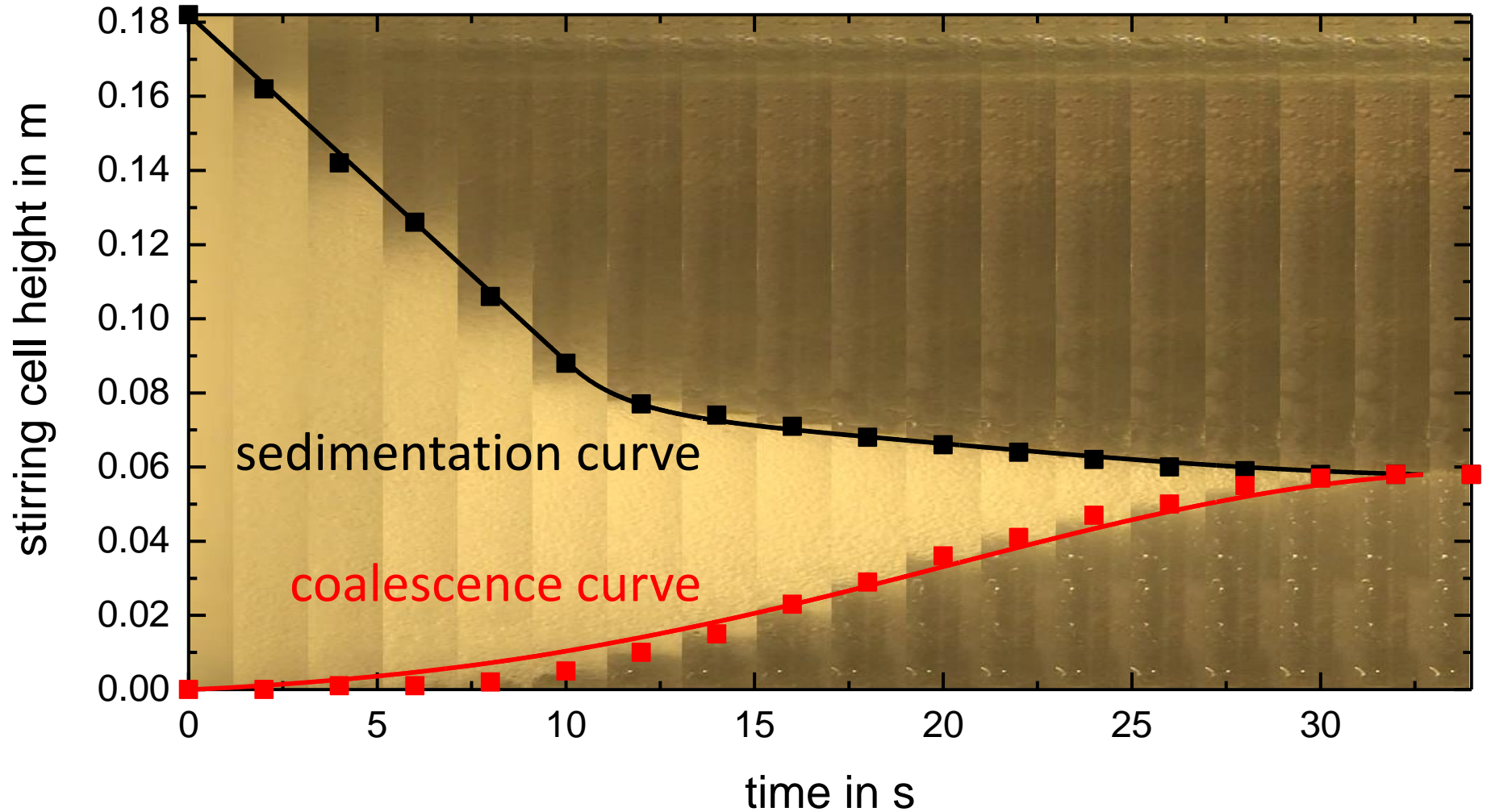
stirrer speed and mixing time effect



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

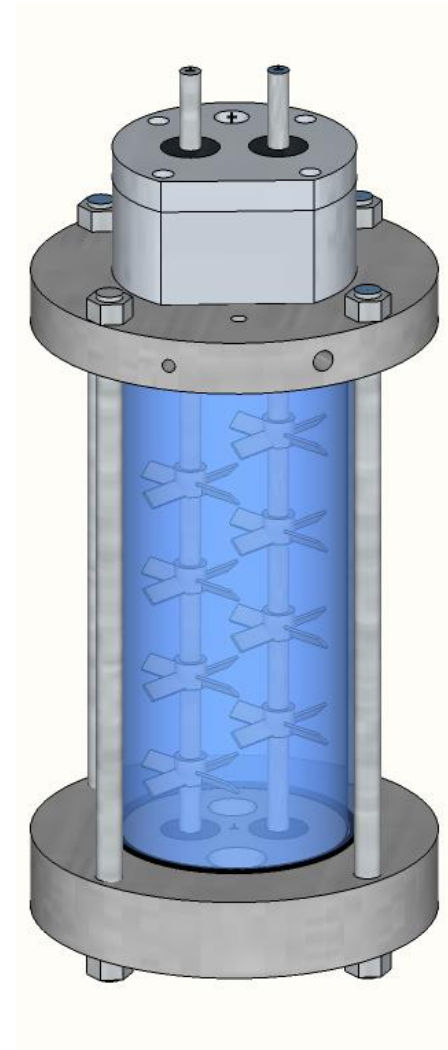


comparison of the two equipment's

	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	-	++

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 curves



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