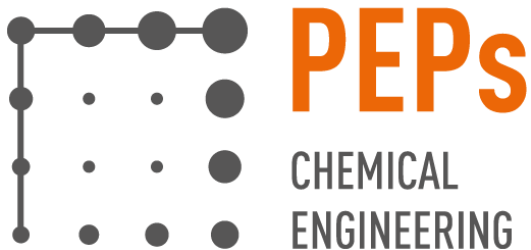

ReDrop: Single-Drop Based Modelling of Extraction

Advances in Separation Science

16.09.2022

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agenda

- ReDrop program
- models and experiments
- applications

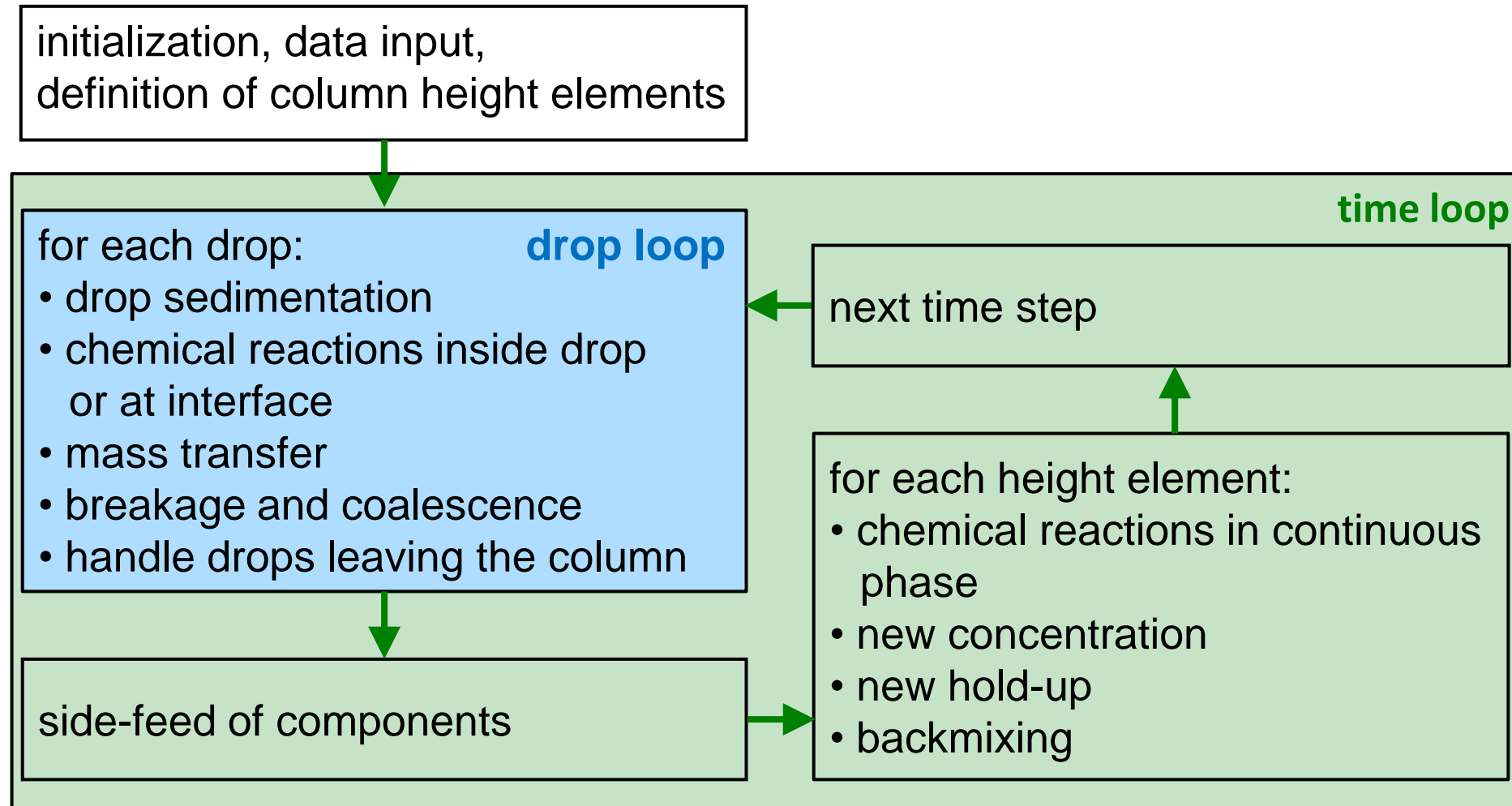
ReDrop (REpresentative DROPs)

- based on **drop behavior** modeling
- standardized **single-drop experiments**
- simulation for **any column type**
- simulation tool for **liquid-liquid equipment design**

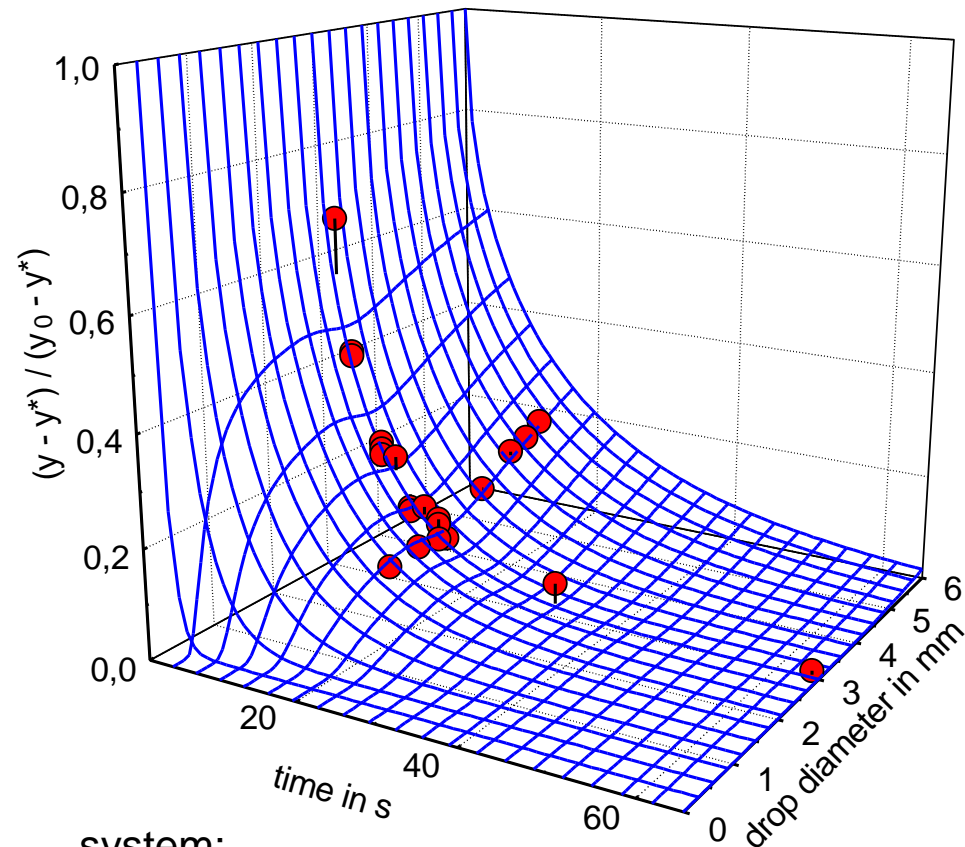
strategies for extractor design

design based on pilot-plant scale experiments	design based on lab-scale experiments
experience-based choice of extractor type	experiments in lab-cells for single-drop behavior
pilot-plant scale experiments optimal extractor chosen?	modelling different extractor types on pilot-plant scale
	knowledge-based selection of optimal extractor type and operating conditions
scale-up of technical extractor	

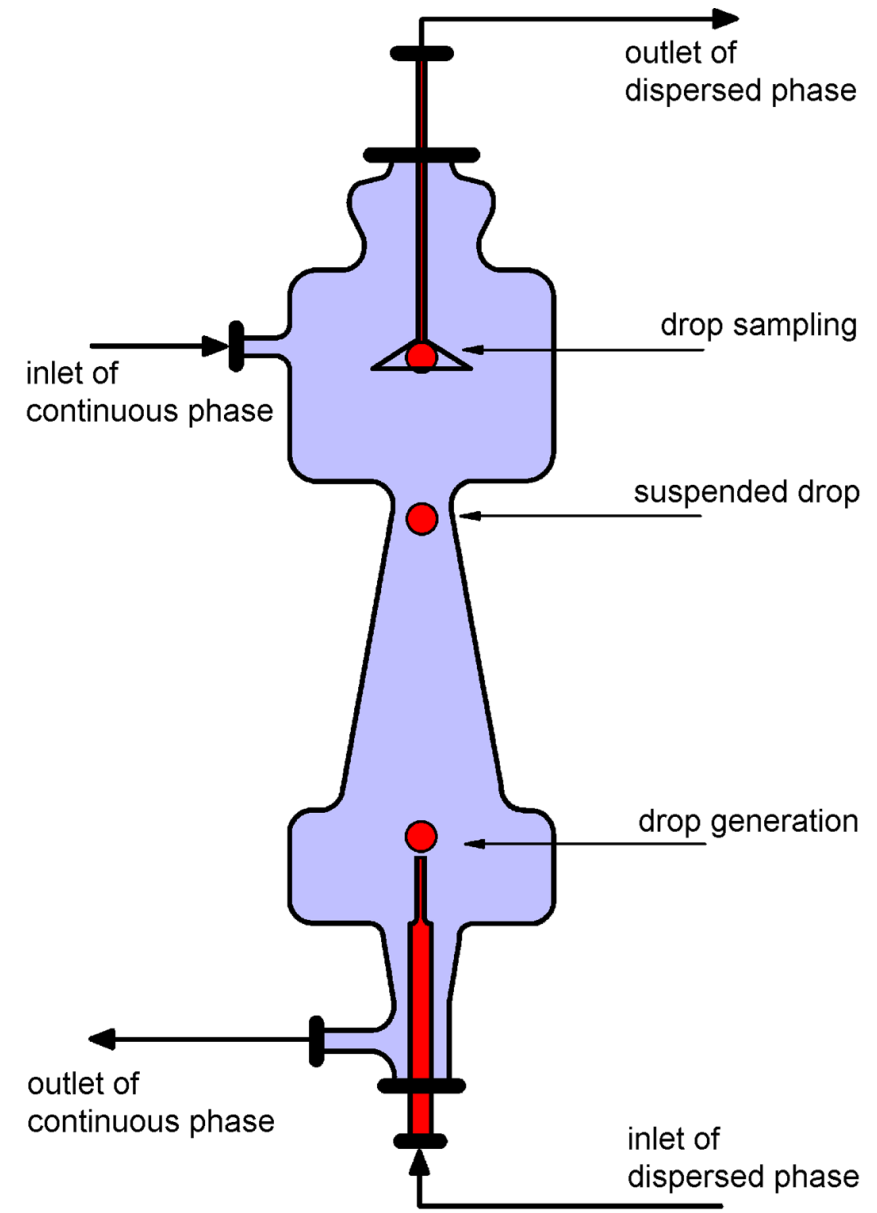
ReDrop algorithm



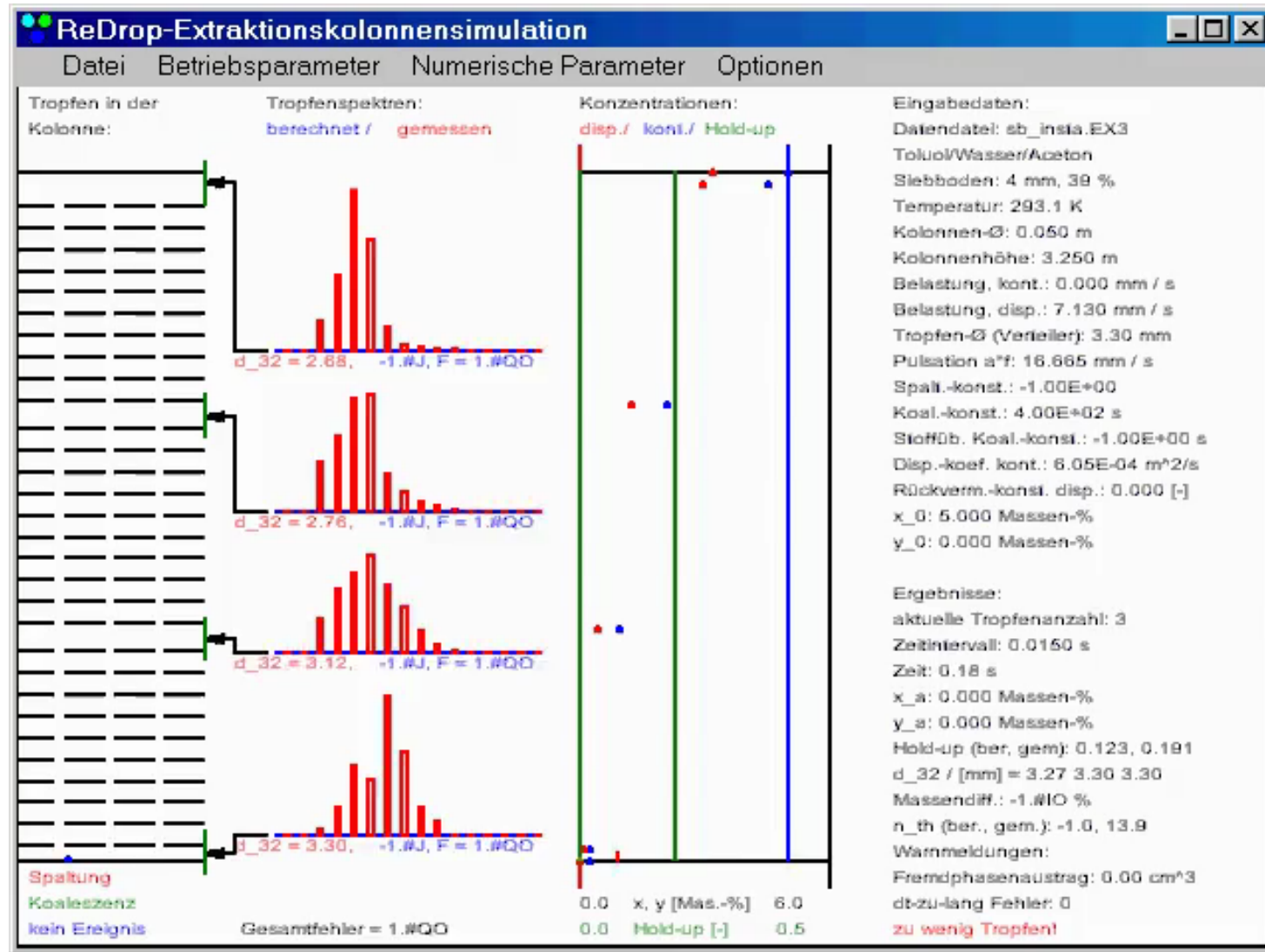
mass-transfer cell



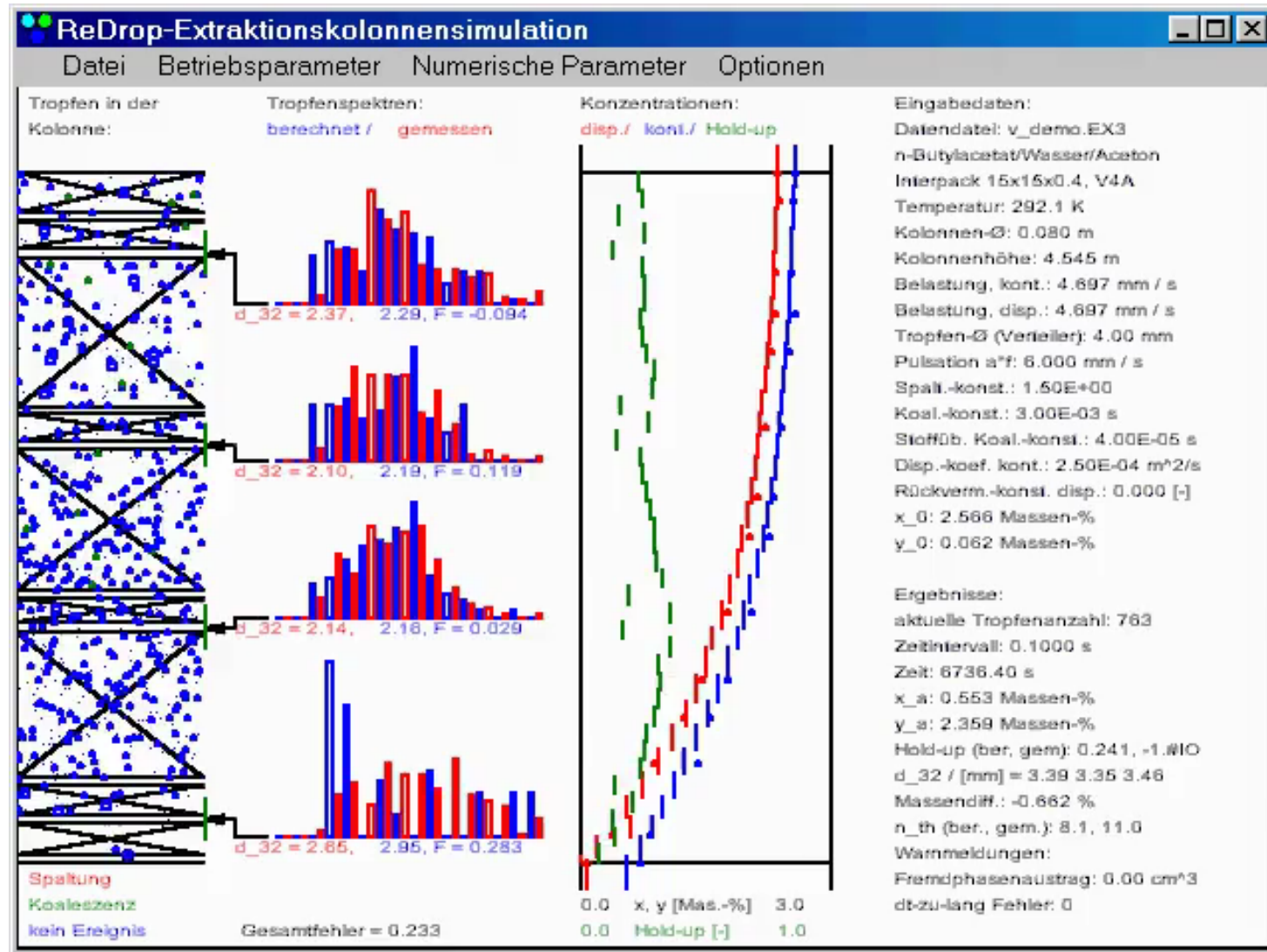
system:
n-butyl acetate (d) + acetone (t) + water (c)
mass-transfer direction: $c \rightarrow d$



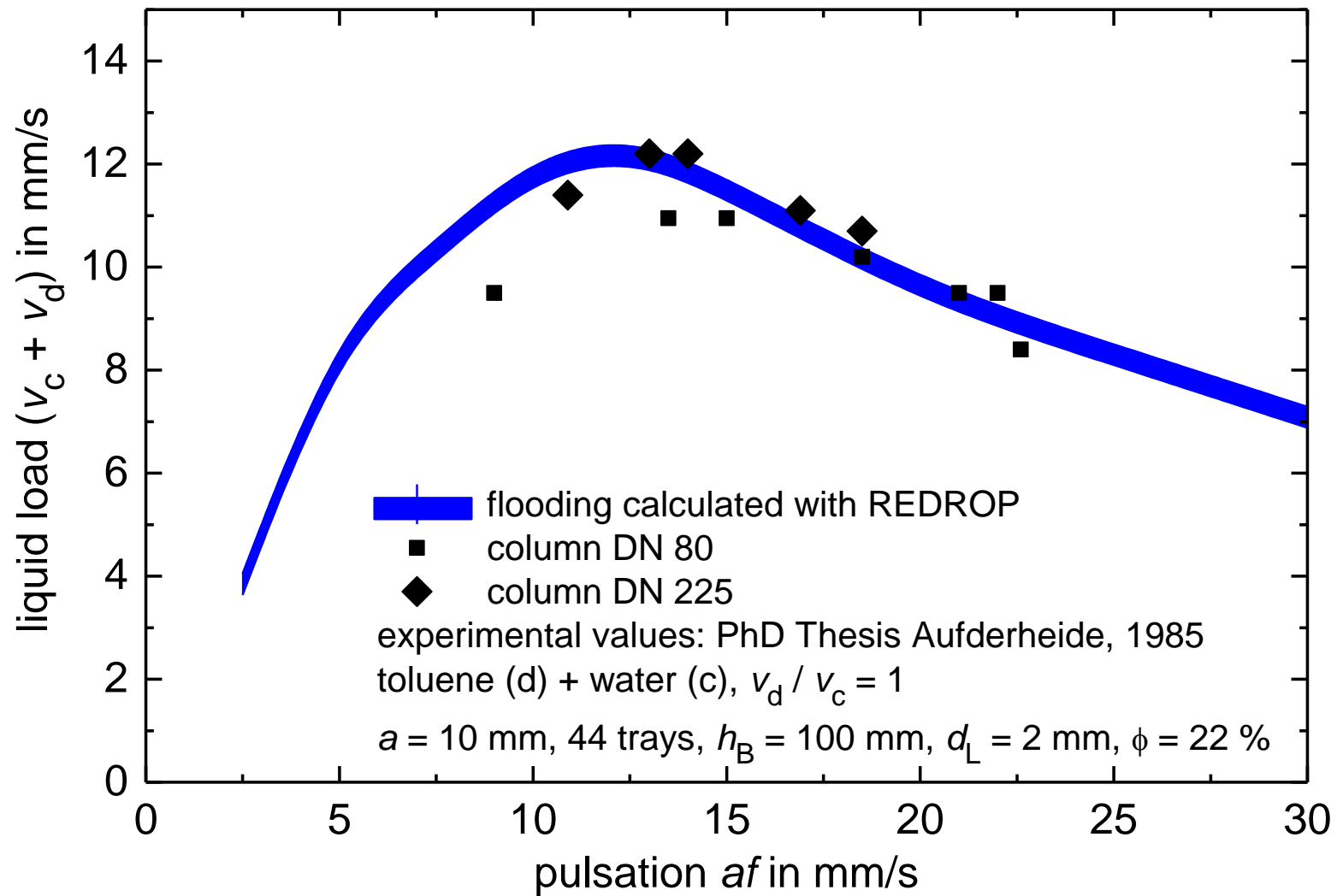
screenshot of ReDrop



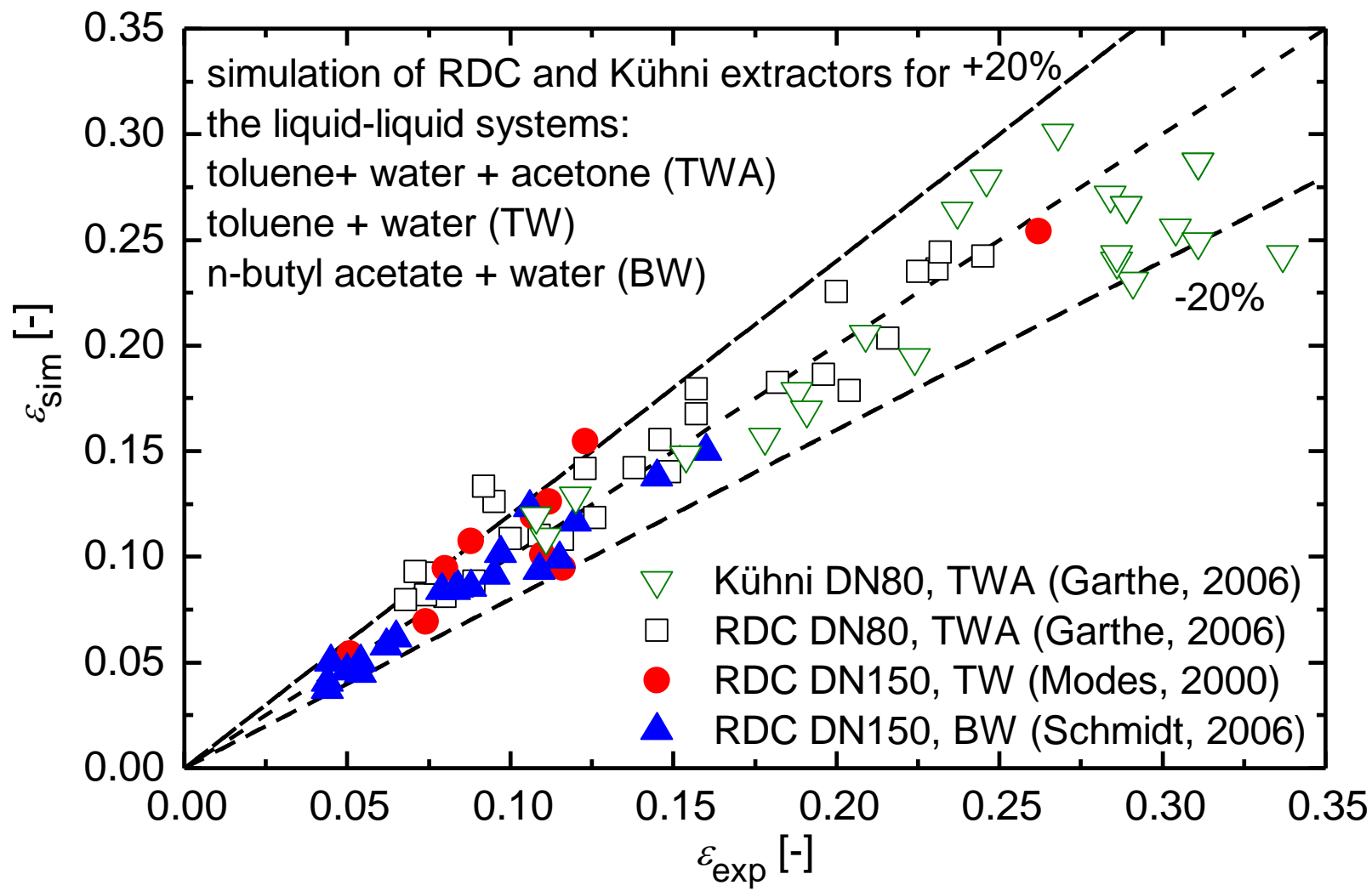
flooding with ReDrop



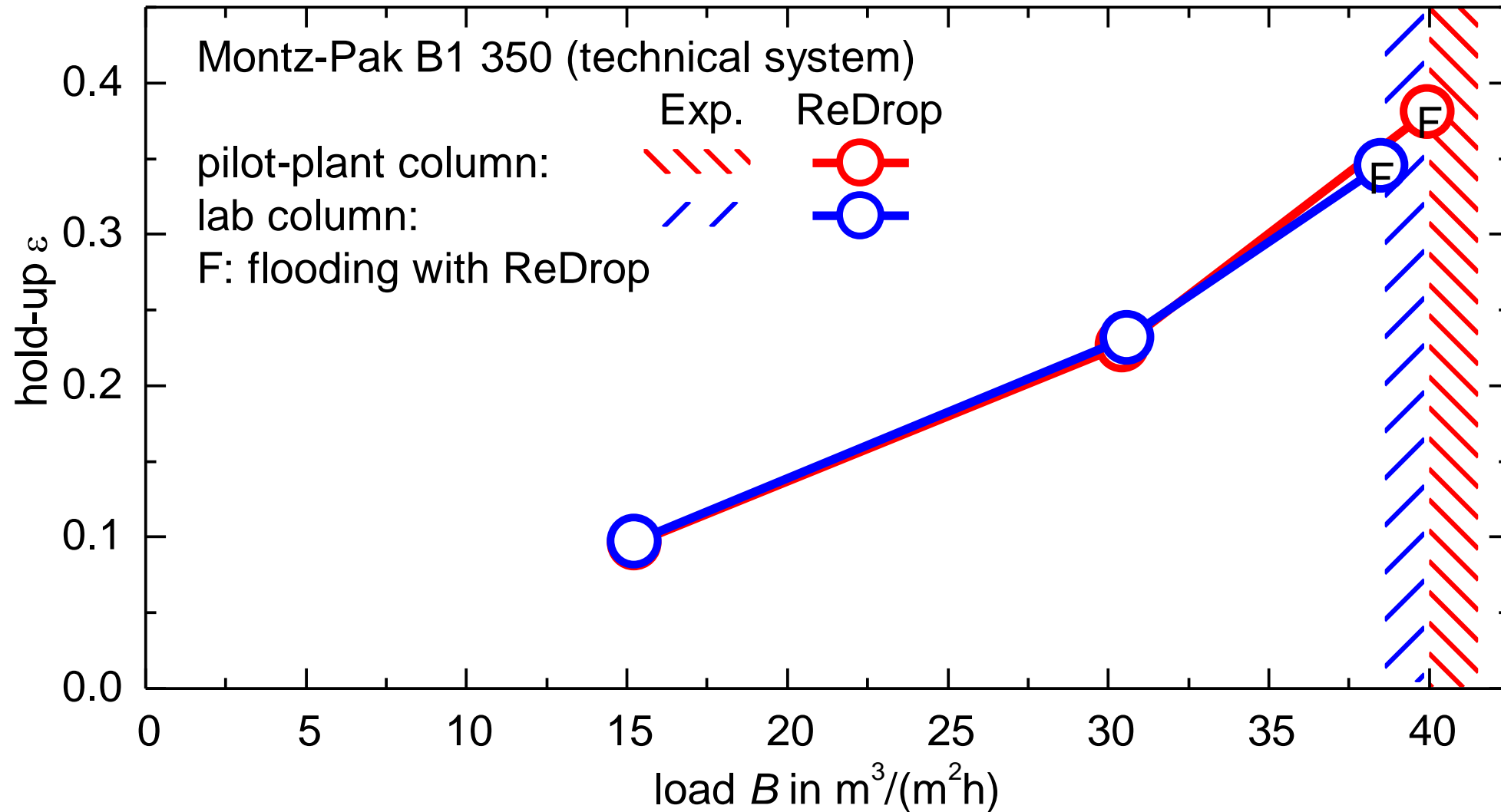
flooding limits



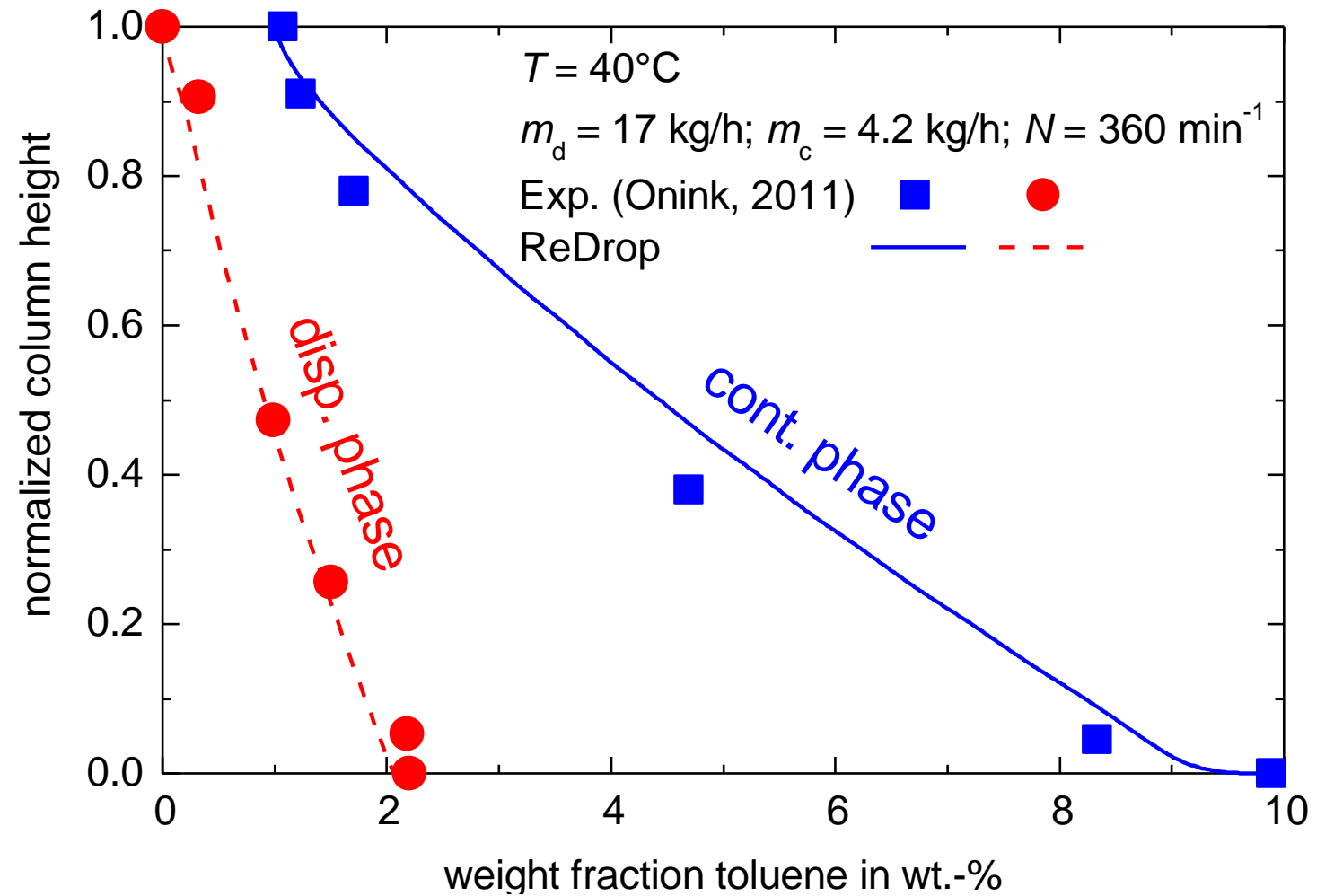
hold-up prediction with ReDrop



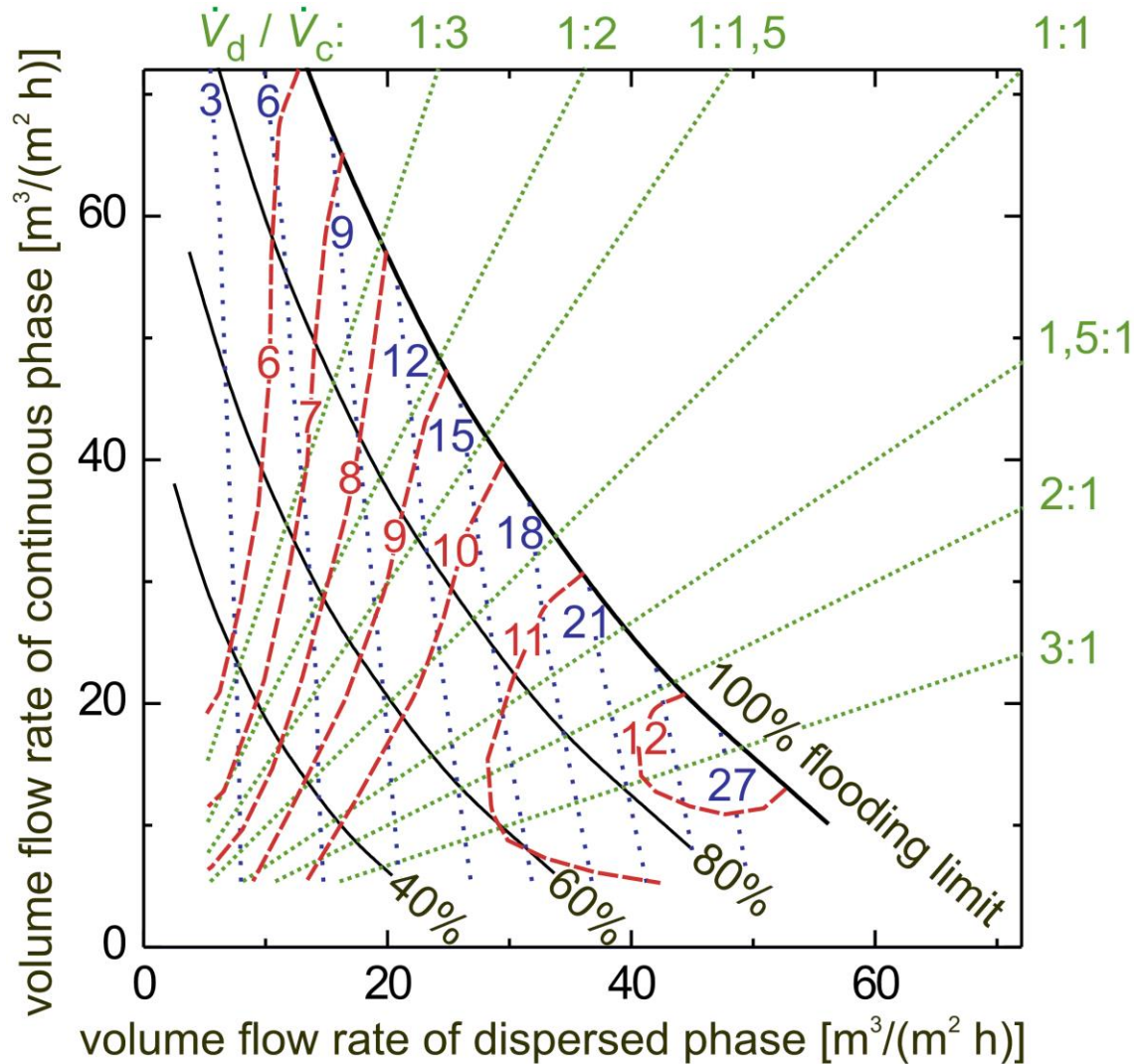
holdup & flooding points (with BASF)



[3-mebupy]DCA (d) + heptane (c) + toluene (c→d)



design diagram



water + butyl acetate + acetone
 sieve-tray column
 $\phi = 39\%$, $d_h = 4 \text{ mm}$
 $af = 11.7 \text{ mm/s}$

- flooding limit
- load relative to flooding limit
- ⋯ phase ratio
- - - number of theoretical stages of 3m column
- ⋯ holdup [%]

advantages

- **fast** to reach steady-state
- **flexible** to any column type and internals
- **knowledge-based** equipment design
- **less chemicals** than pilot-plant experiments
- **standardized** single-drop experiments
- up to and including **operation limits**

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