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# ReDrop: single-drop-based modelling of extraction columns

## SFGP - Toulouse

### 10.11.2022

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# agenda

- ReDrop program
- models and experiments
- applications

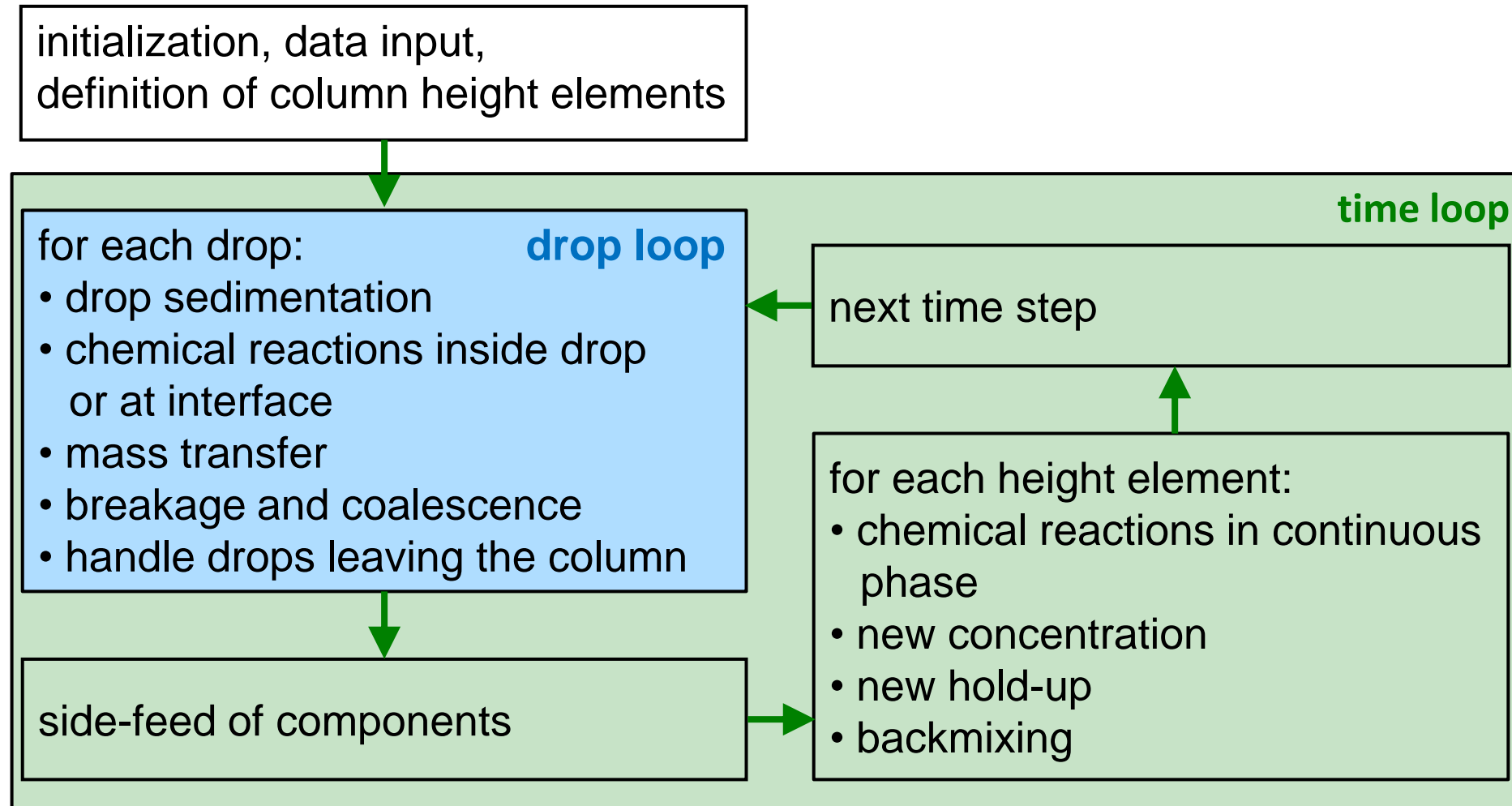
# ReDrop (REpresentative DROPs)

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

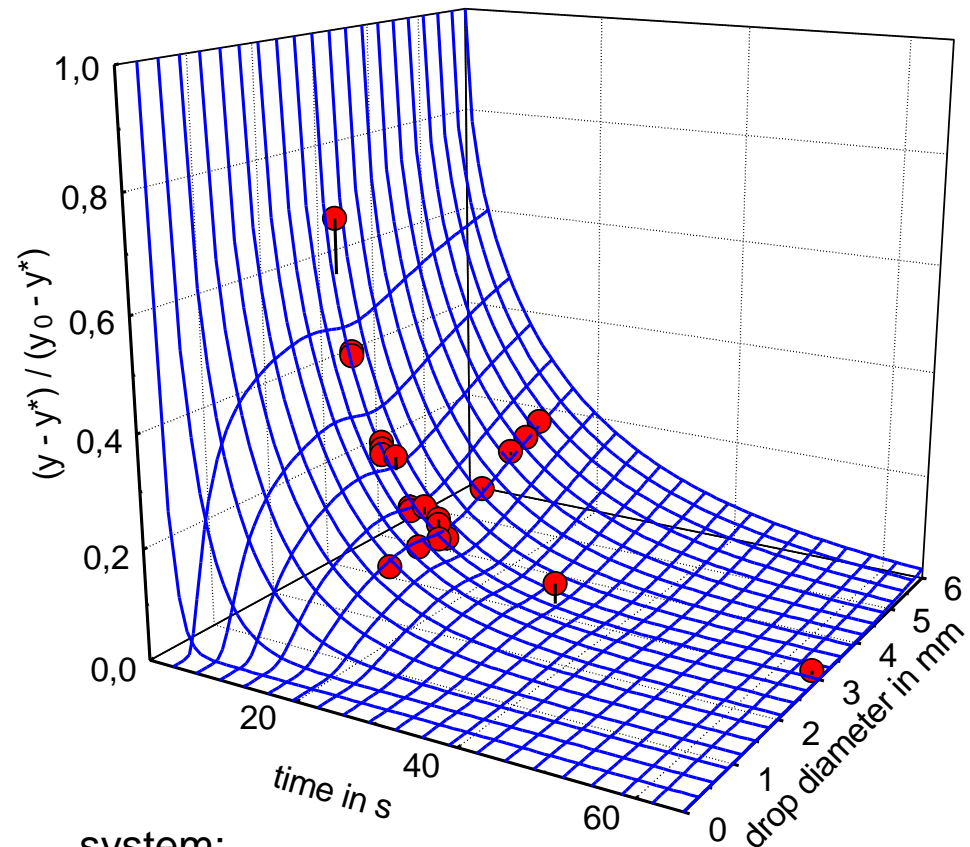
# strategies for extractor design

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

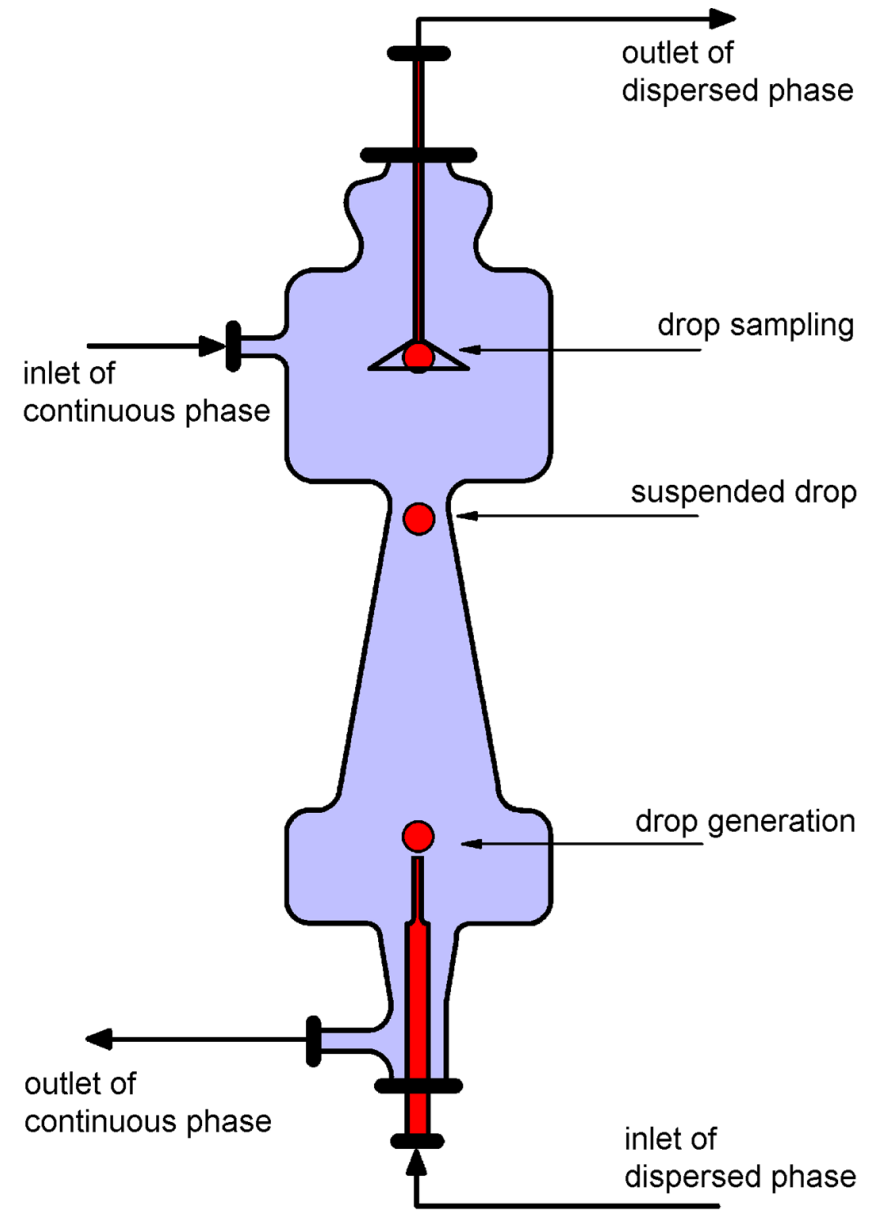
# ReDrop algorithm



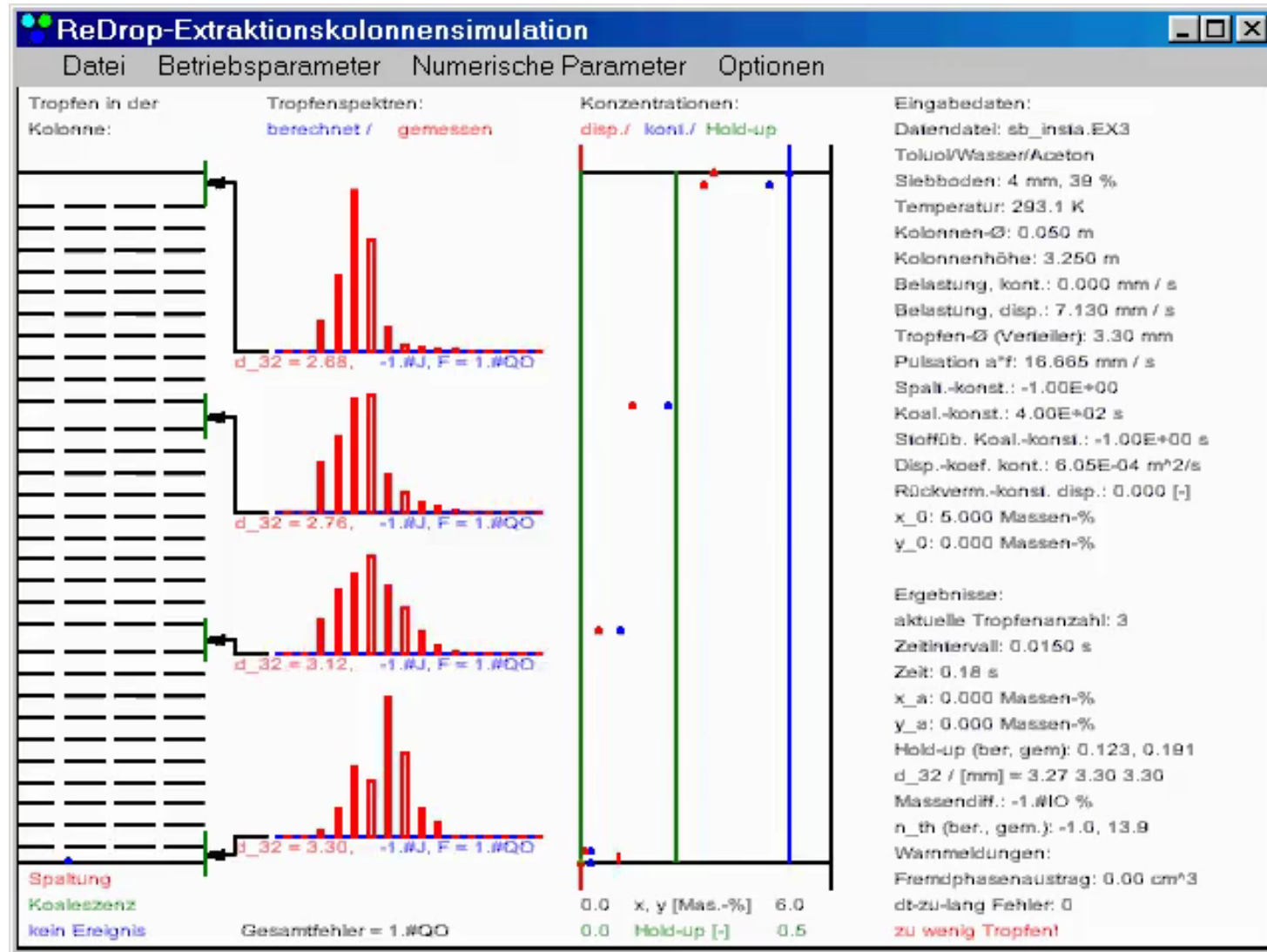
# mass-transfer cell



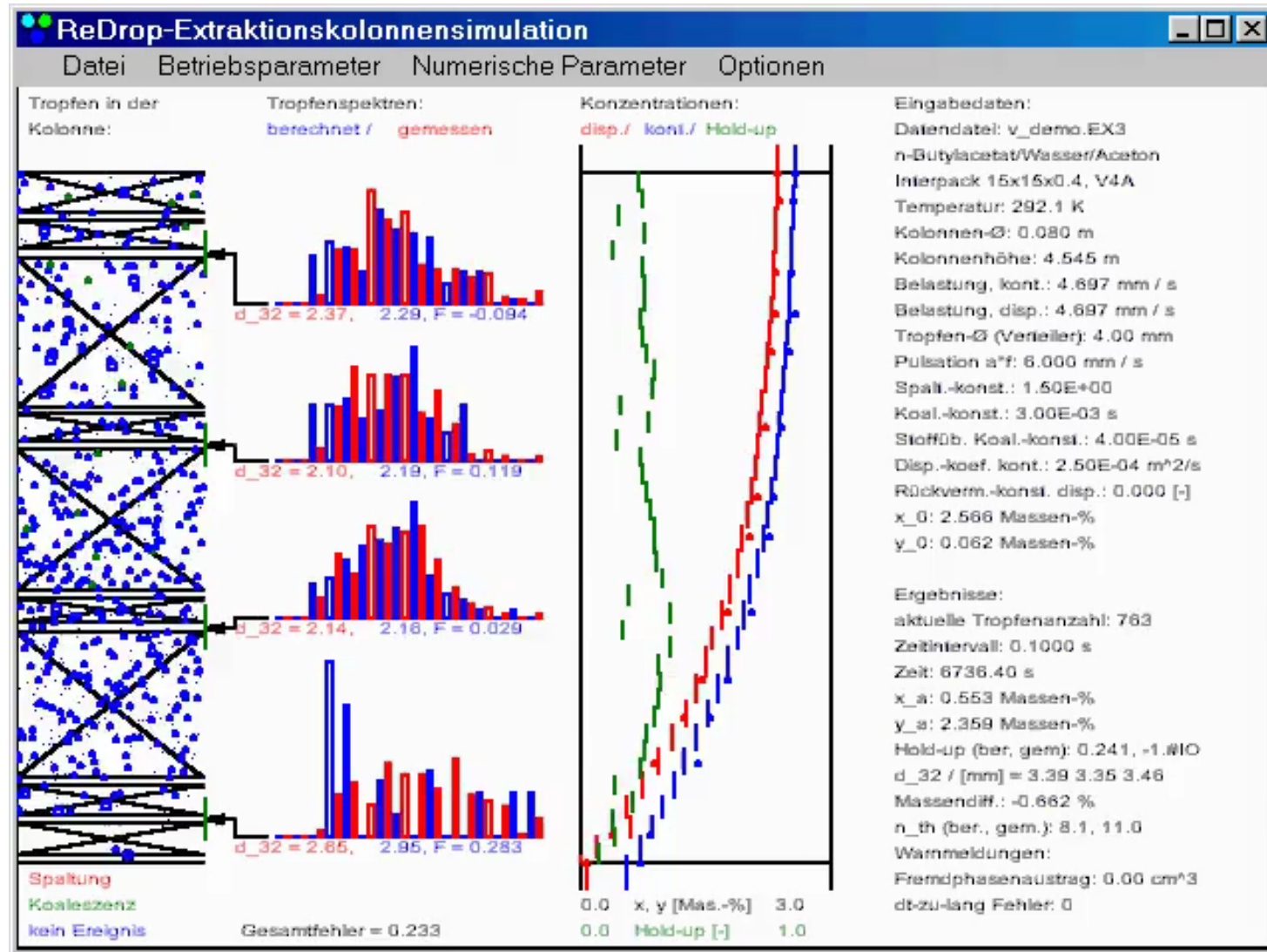
system:  
n-butyl acetate (d) + acetone (t) + water (c)  
mass-transfer direction: c → d



# screenshot of ReDrop

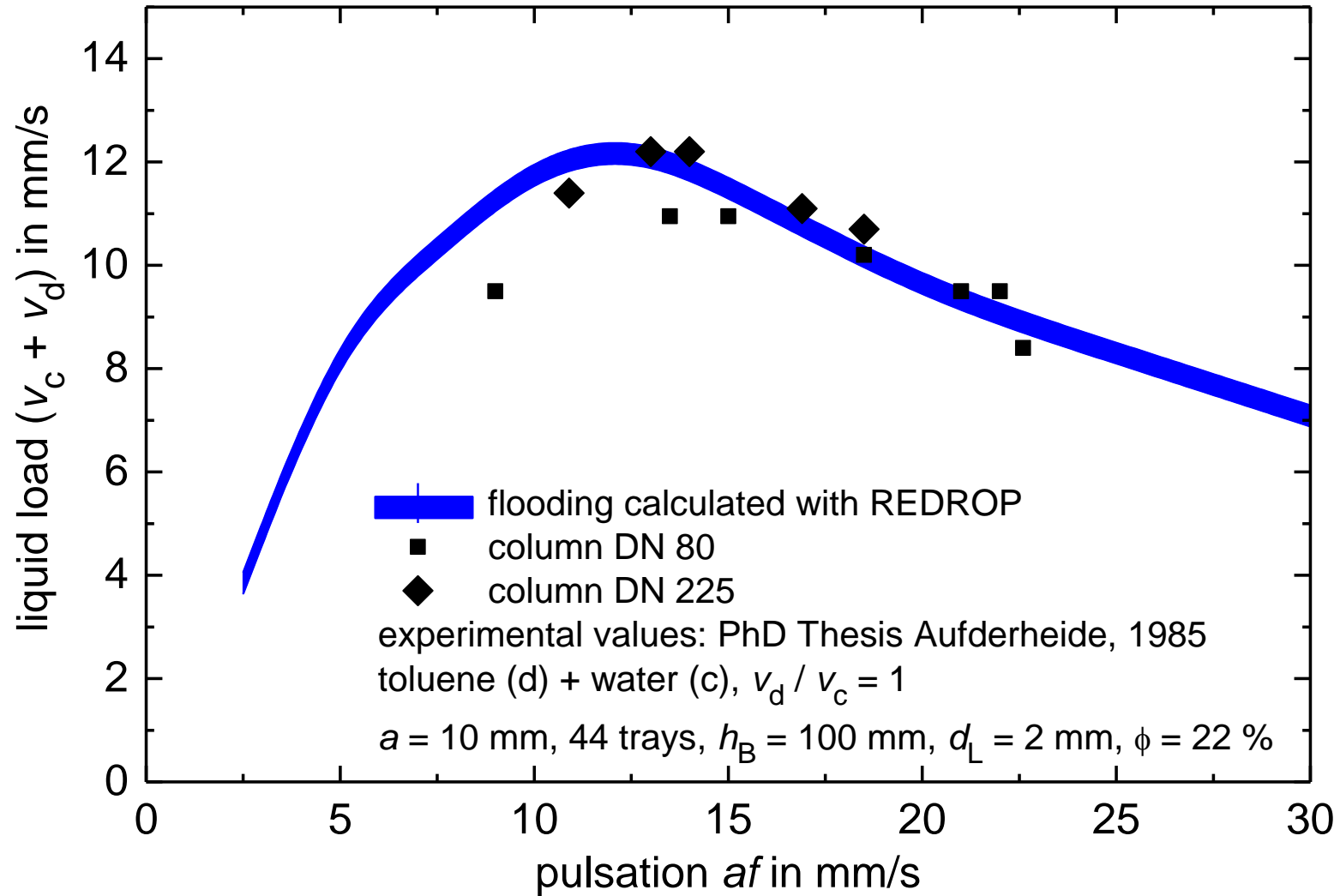


# flooding with ReDrop

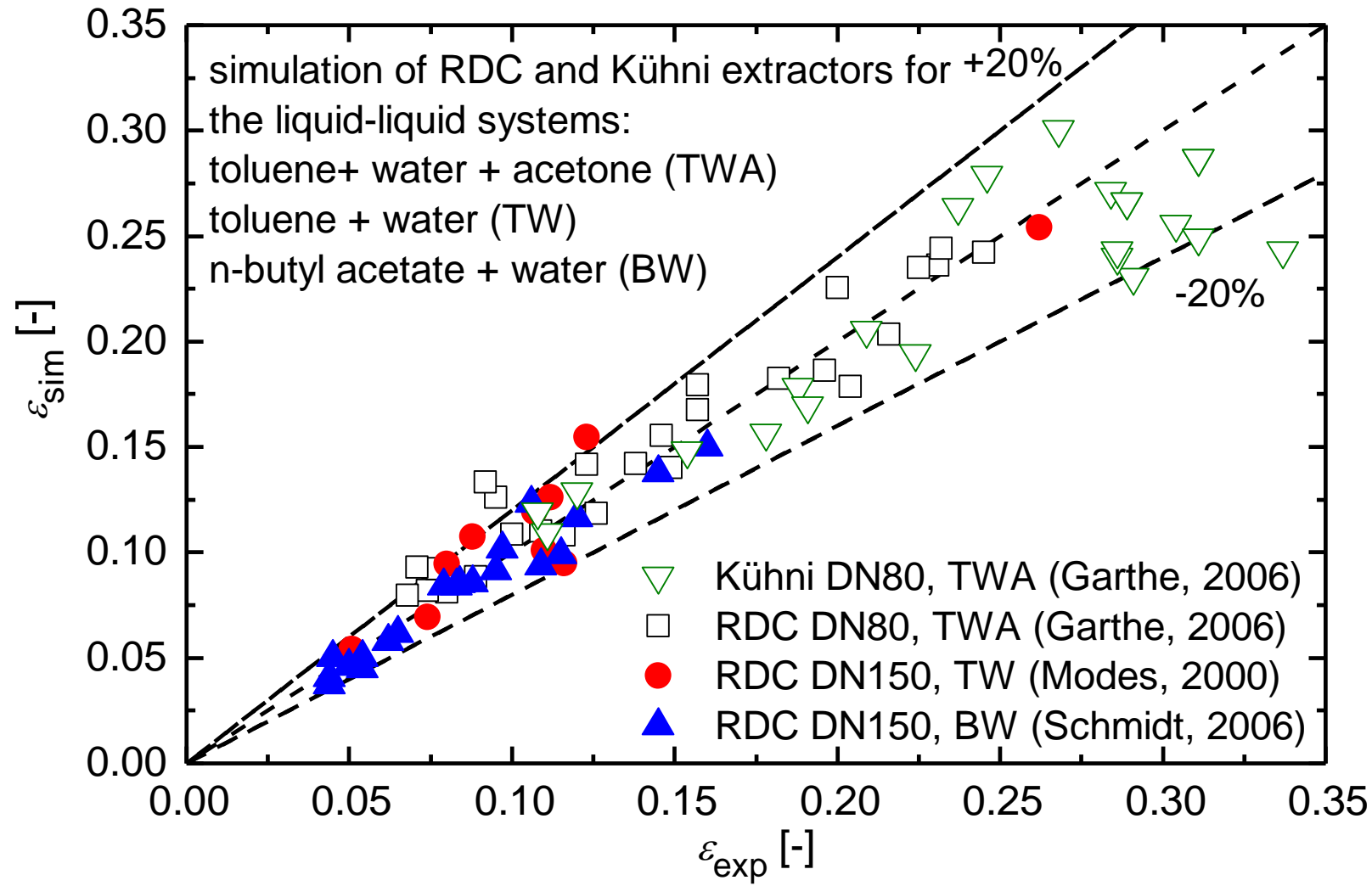




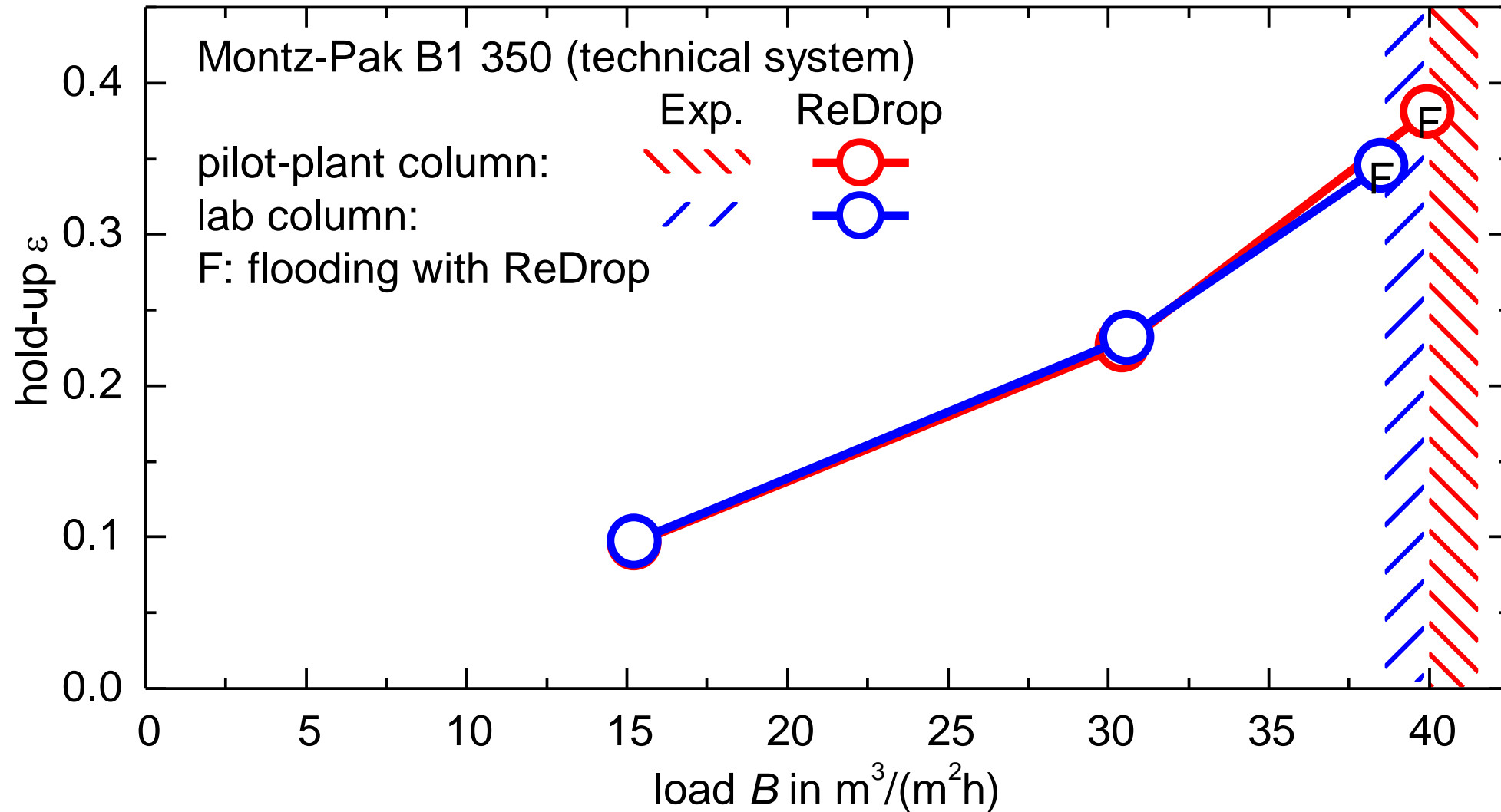
# flooding limits



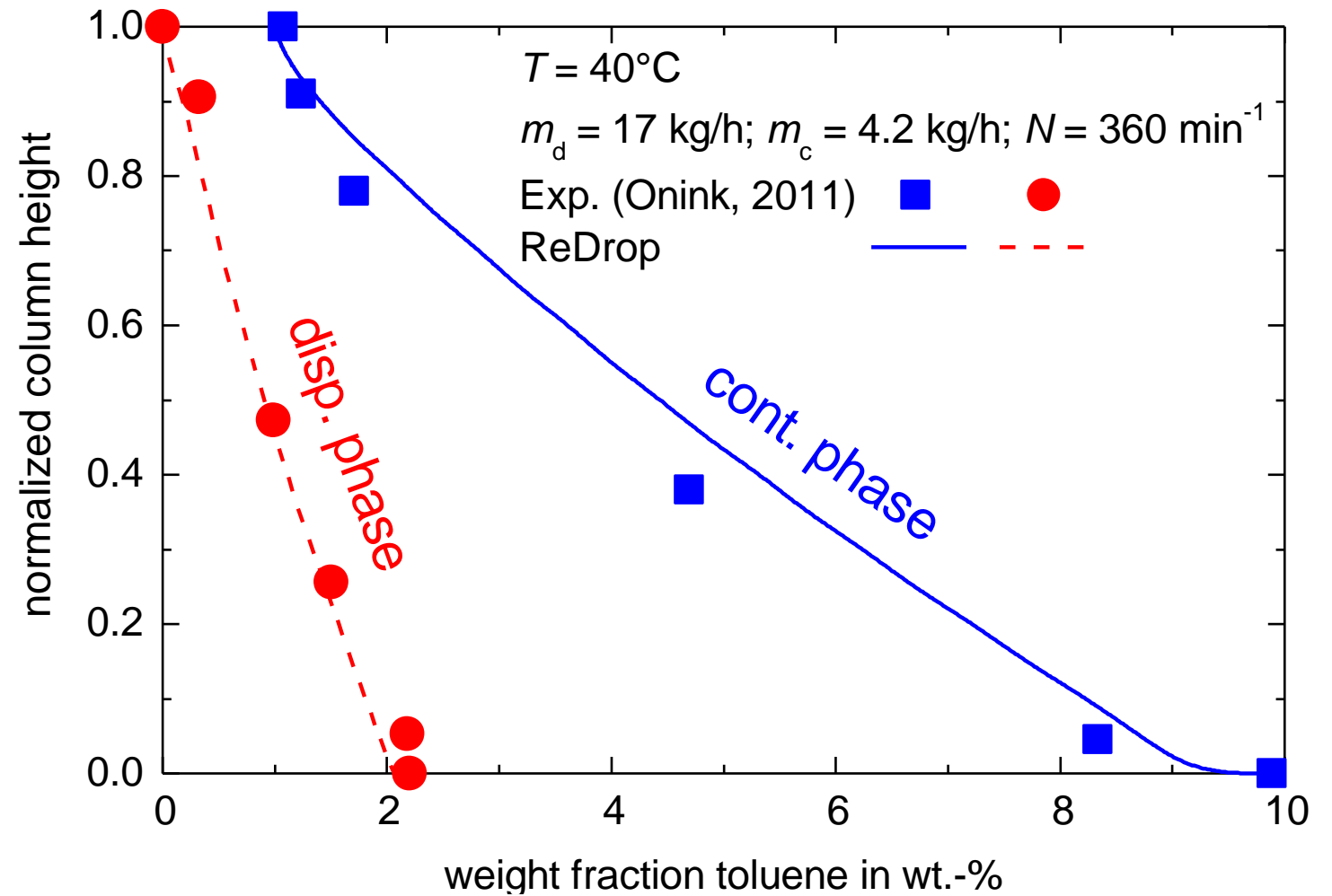
# hold-up prediction with ReDrop



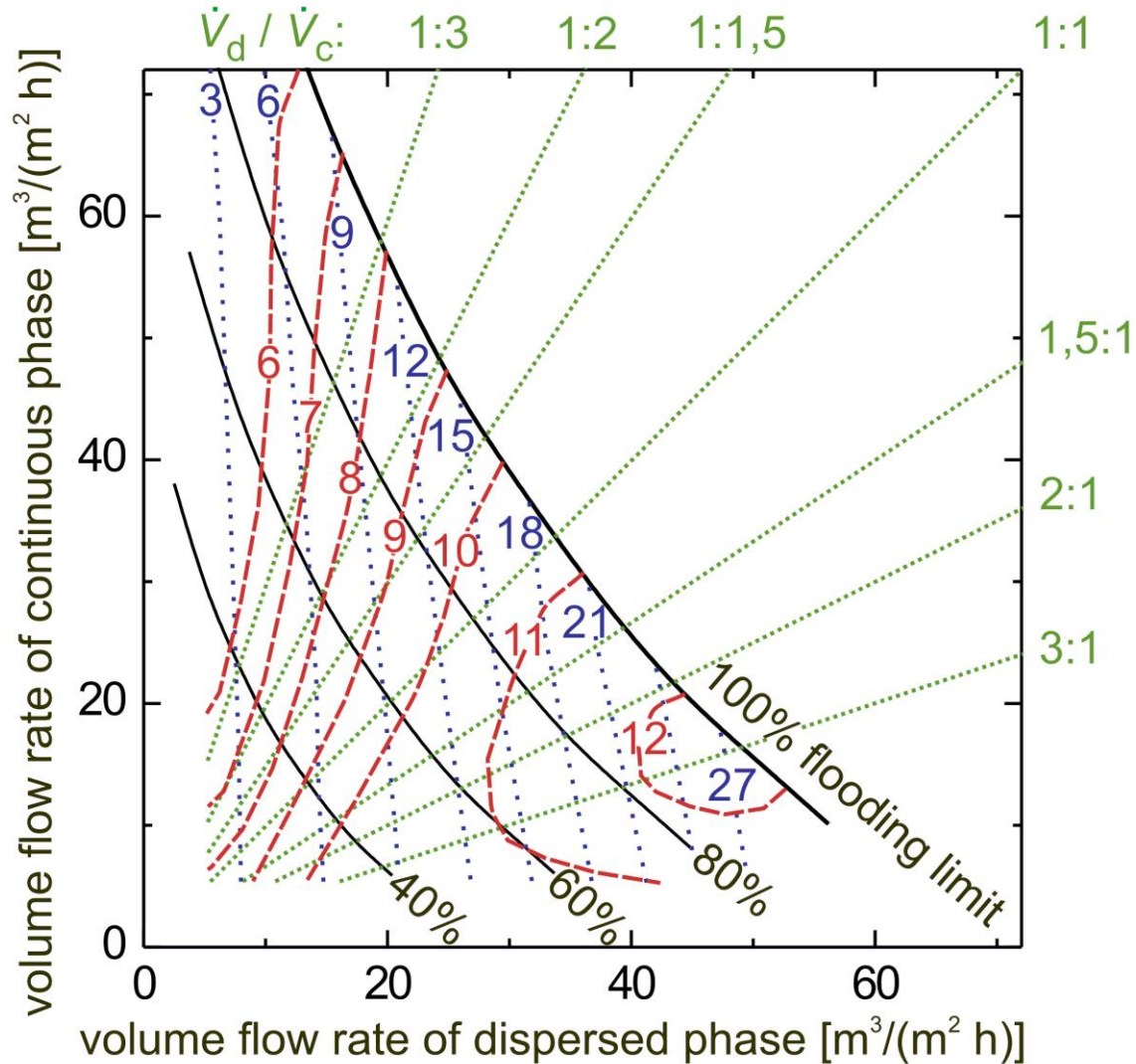
# holdup & flooding points (with BASF)



# [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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