THIN-FILM IN BIO-MICRO SYSTEMS

Thin-film bio-flow systems can only be predicted with modelling of subgrid effects

No thin-film model

Thin-film subgrid model
DROPLET CONTROL IN MICROMIXER

RAINDANCE Inc., USA
DROPLETS IN A BUBBLE DISPENSER

(Jie & Attinger, Columbia Uni, NY)

DROPLETS IN A BUBBLE DISPENSER

(Jie & Attinger, Columbia Uni, NY)
**EXP. VS. TRANSAT**

![Image of experimental setup and TransAT comparison](image)

Figure 7: Comparison between experiment [10] (left) and TransAT (right).

- **Bubble length (normalized):** $d/h$
- **Distance between bubbles:** $L/h$
- **Liquid fraction:** $\alpha = J_L / (J_L + J_G)$

\[ \begin{align*}
10^0 & < \alpha < 10^1 \\
10^{-1} & < J_L / (J_L + J_G) < 10^0 \\
10^0 & < (J_L / (J_L + J_G)) \times 10^0 \\
10^1 & < (J_L / (J_L + J_G)) \times 10^0
\end{align*} \]
DROPLET DETACHMENT AND TEAR-OFF

The Top-spot experiment “Glatzel et al., Comp. Fluids “, 2008

droplet tear-off & miniscus formation
MICRO-ENCAPSULATION OF DRUG PILLS (INOTECH SWITZERLAND)

Jet diameter: 1mm
Frequency: 200-300 Hz
Viscosity: 85 mPa
PHASE SEPARATION: VISCOELASTIC EFFECTS

Phase field H model in TransAT

![Image of phase separation patterns](image_url)
DROPLET BREAKUP IN A T-JUNCTION (LEVEL SET)

Figure 9: Droplets generated by cross-flow shear in a T-junction. Micrograph data from [27].
FLOW IN A SRINGE