

CFD in Medical Devices

ADVANCED MODELLING & SIMULATION – AMS –

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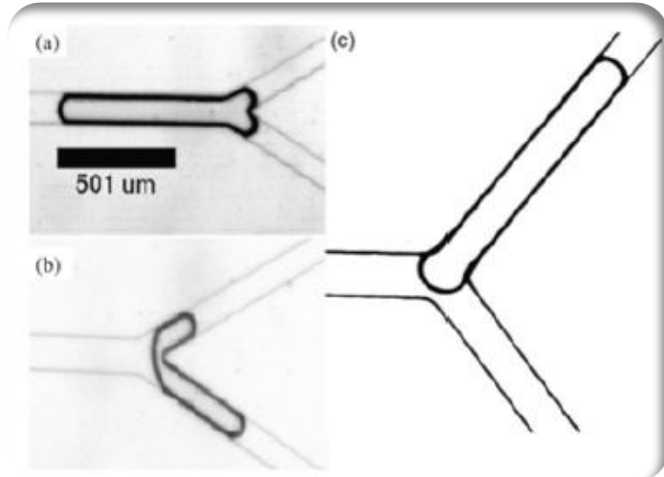
JUNE 2020

Medical devices

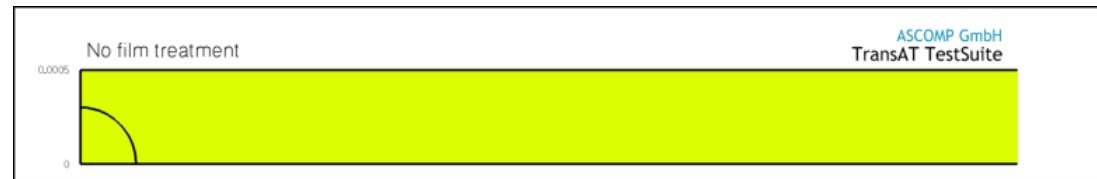
DJAMEL LAKEHAL; SECTION HEAD, AFRY AMS.

THIN-FILM BIO-FLOW SYSTEMS CAN ONLY BE PREDICTED WITH MODELLING OF SUBGRID EFFECTS

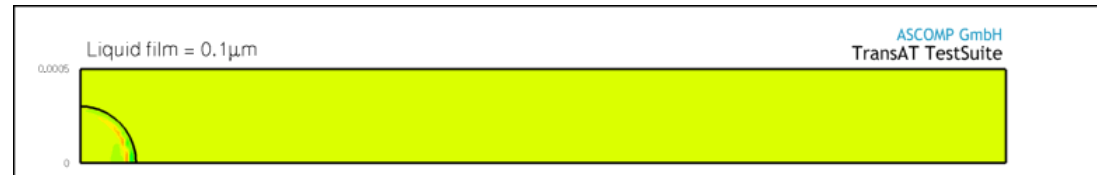
Thin-film in bio-micro systems



No thin-film model

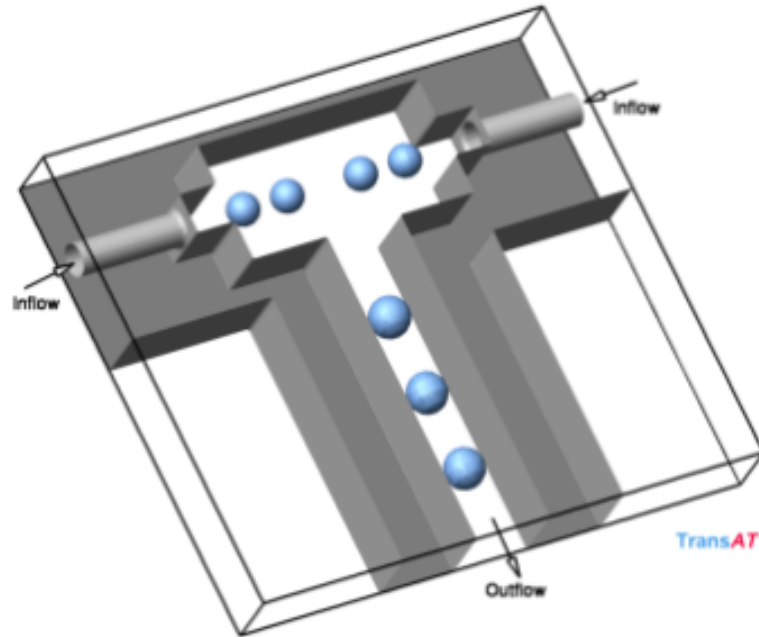


Thin-film subgrid model

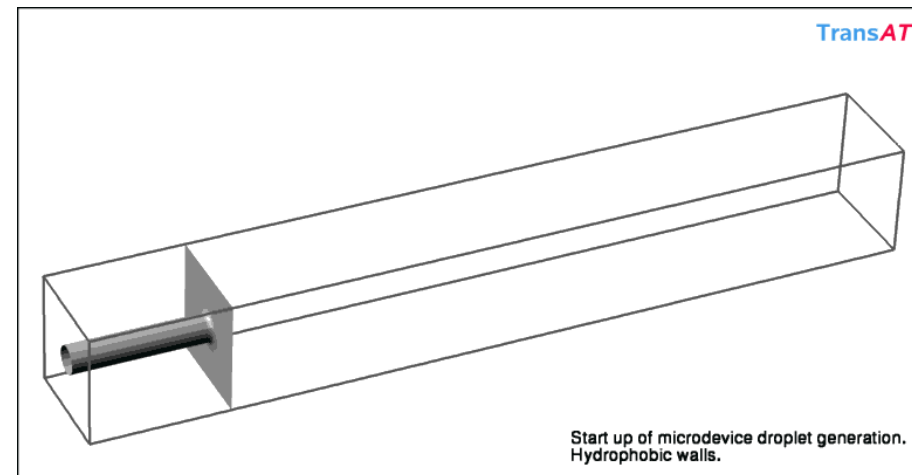
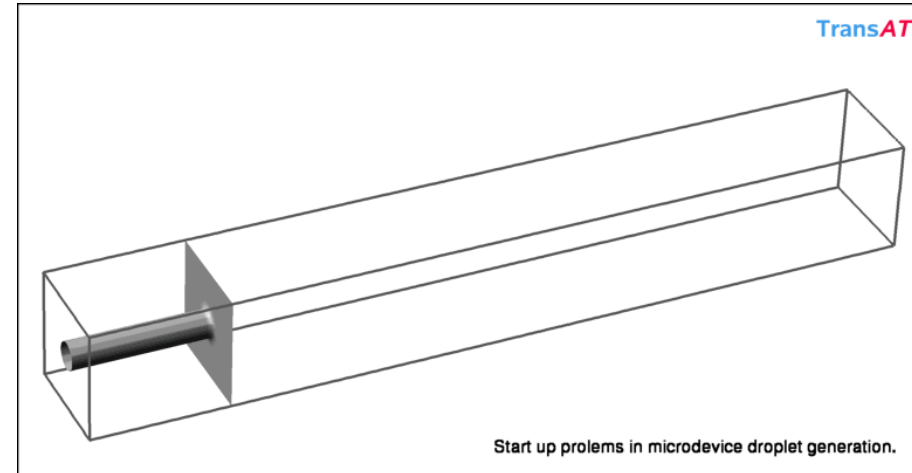


THIN-FILM BIO-FLOW SYSTEMS CAN ONLY BE PREDICTED WITH MODELLING OF SUBGRID EFFECTS

Droplet control in micromixer

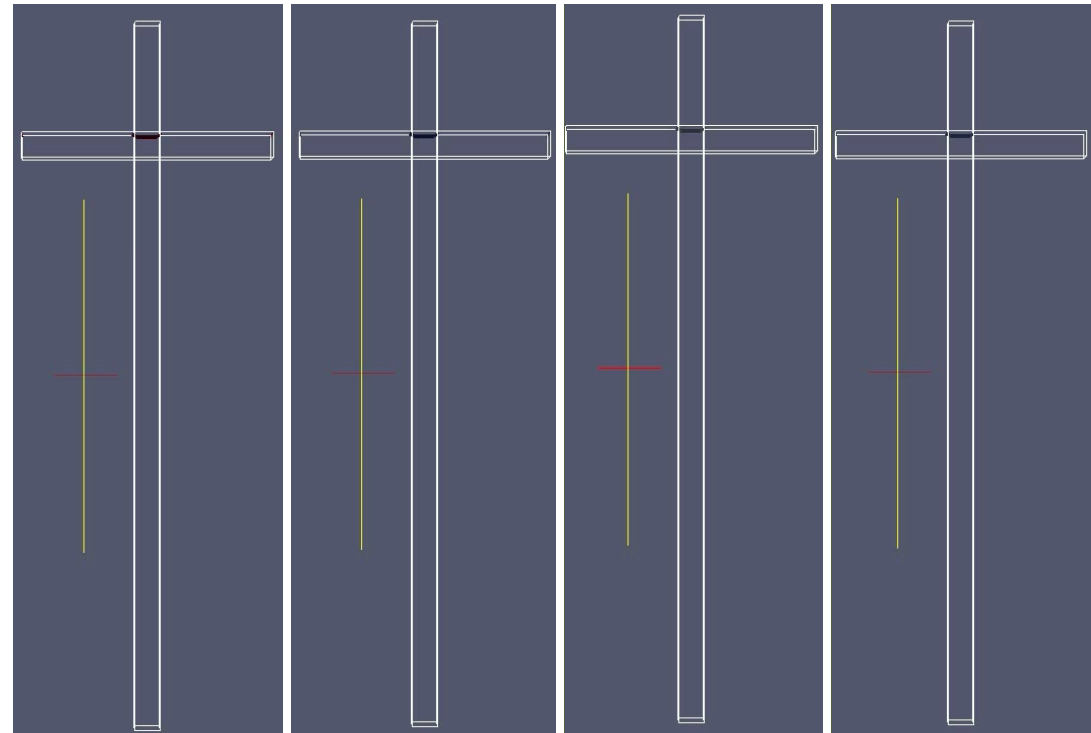
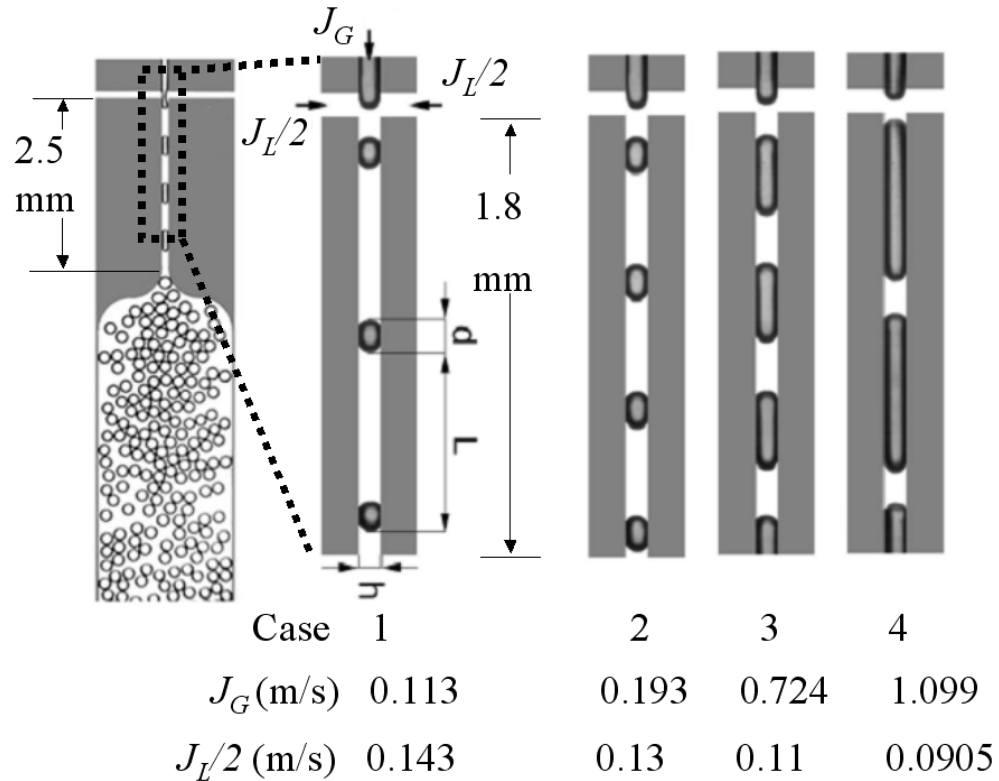


RAINDANCE Inc., USA



(JIE & ATTINGER, COLUMBIA UNI, NY)

Droplets in a Bubble Dispenser



Exp: Cubaud, T., et al. Physical Review E -, 2005.

(JIE & ATTINGER, COLUMBIA UNI, NY)

Exp. vs. TransAT

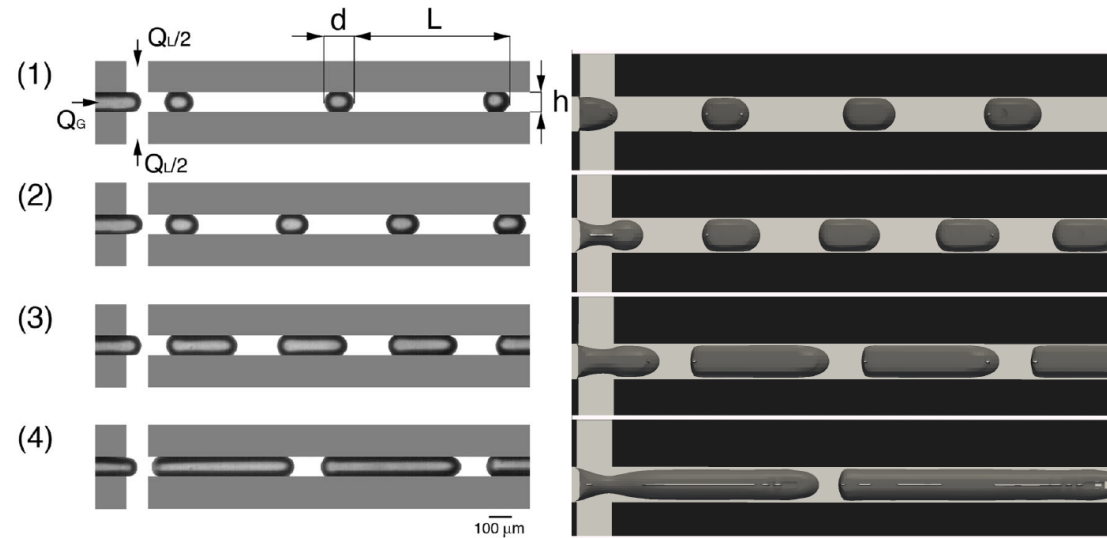
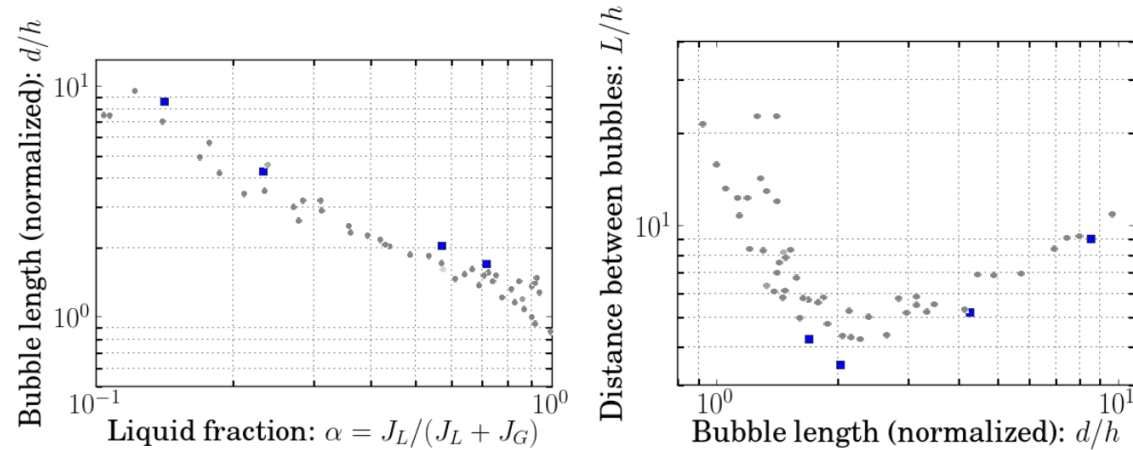
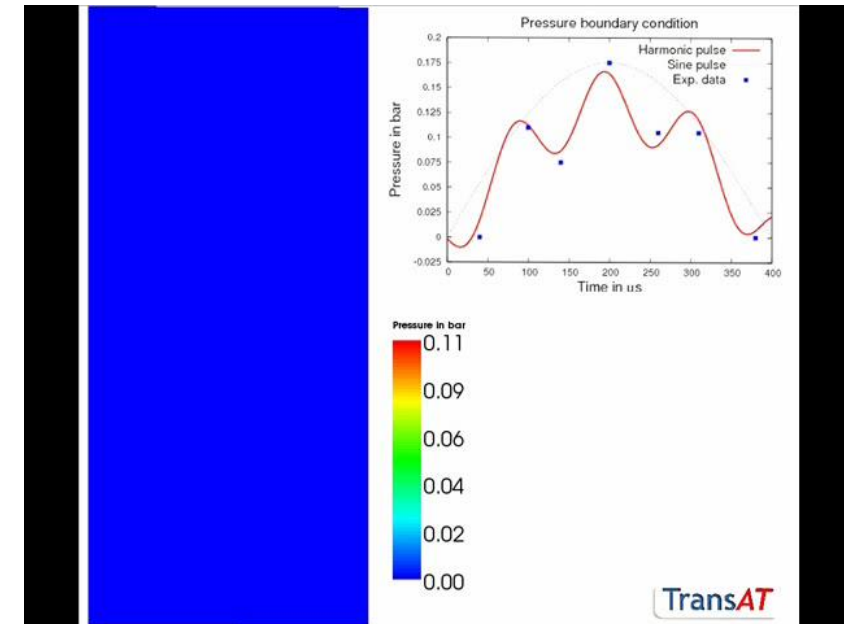
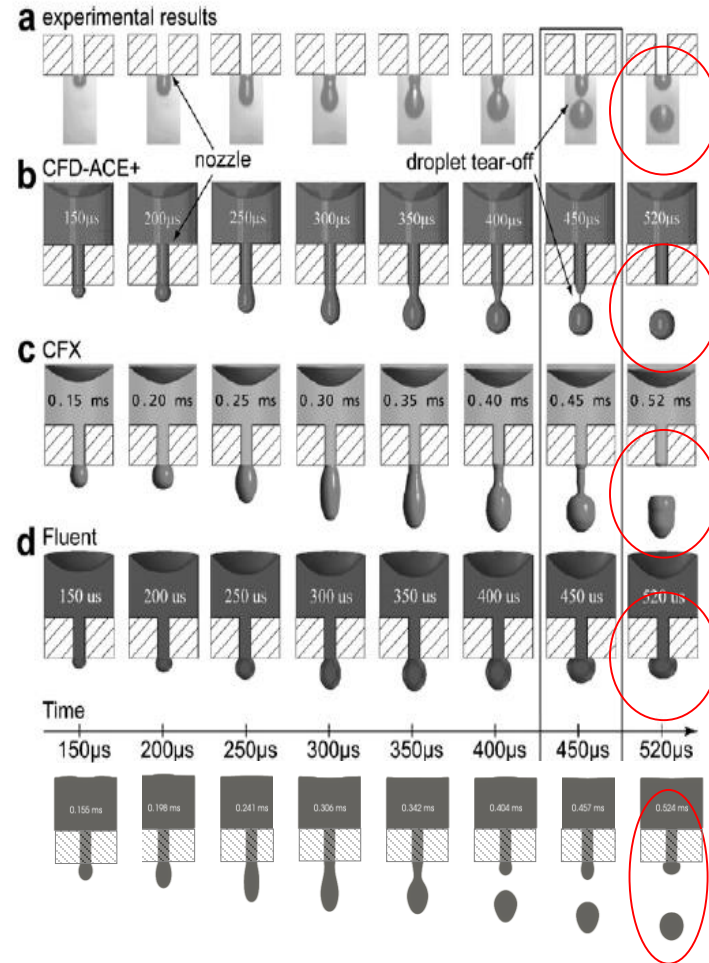


Figure 7: Comparison between experiment [10] (left) and TransAT (right).



Droplet detachment and tear-off

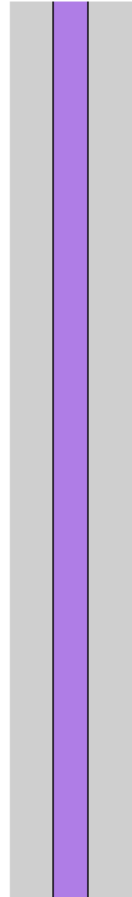


droplet tear-off & miniscus formation

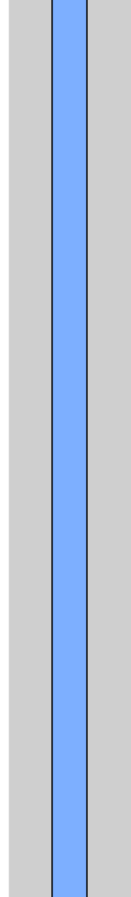
Micro-encapsulation of drug pills (INOTECH)



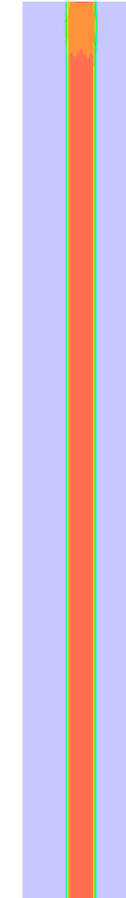
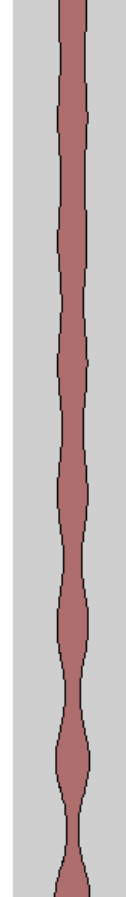
Exp.



Frequency effect



Viscosity effect



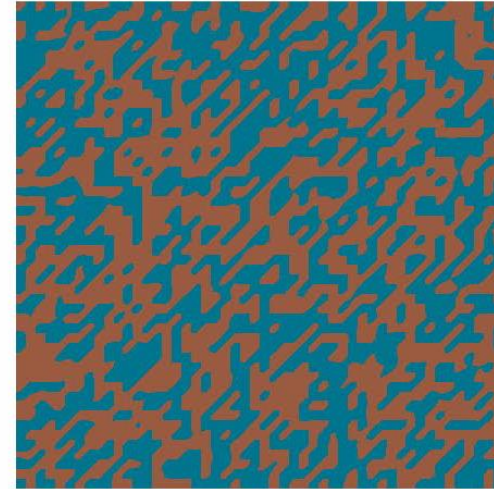
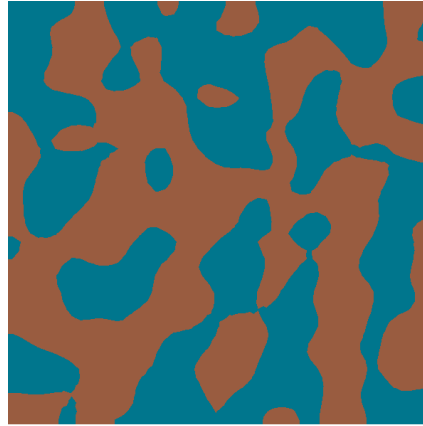
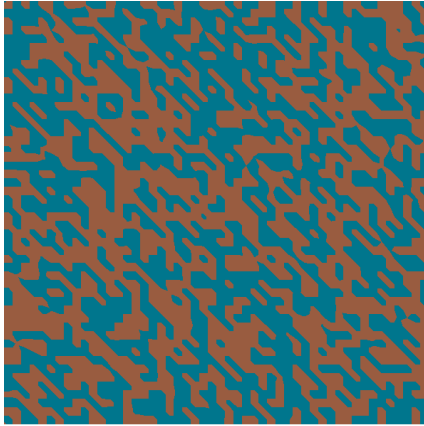
Shear thinning

Jet diameter: 1mm

Frequency: 200-300 Hz

Viscosity: 85 mPa

Phase Separation: Viscoelastic Effects



Droplet breakup in a T-Junction

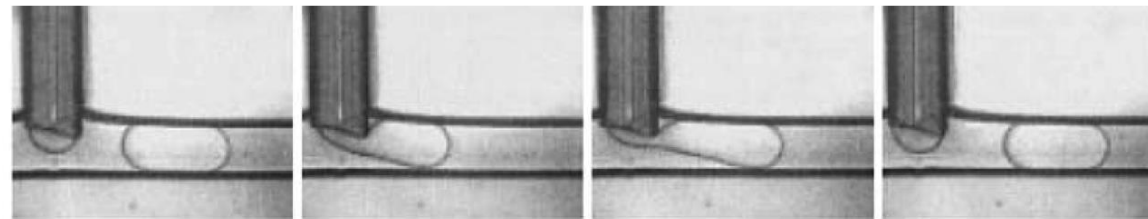
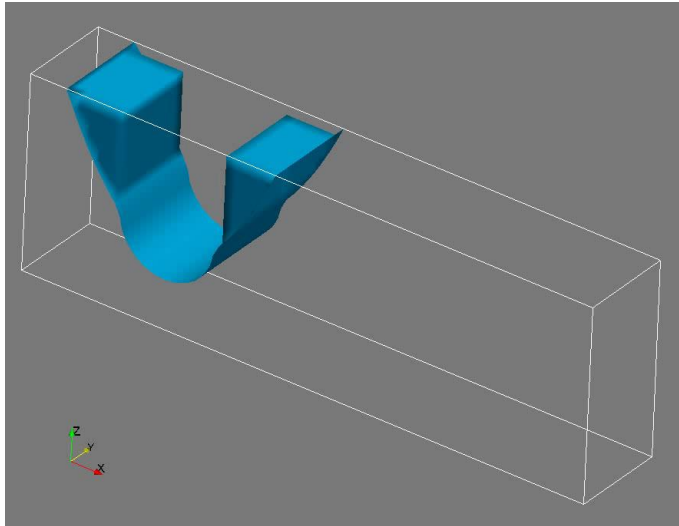


Figure 9: Droplets generated by cross-flow shear in a T-junction. Micrograph data from [27].

LEVEL SET APPROACH IN TRANSAT CFD

Flow in a Syringe





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