Cutting of rising bubbles by a wire without contact

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Motivation
- Use of wire meshes as catalyst carriers [1]
- Widespread use of bubble columns in industry with high optimization potential
- Installation of internals in the reactor to break up the bubbles
  - Increase of the interfacial area
  - Increase of heat and mass transfer

Experiments
- Experiments with 90 wt.-% viscous glycerol-water solution
- Recording of bubble cutting process by high-speed camera
- Variation of cylinder diameter $d_c$ and material (contact angle $\theta$)
  - Glass $\theta \approx 40^\circ$
  - Teflon $\theta \approx 90^\circ$
  - hydrophobic coating $\theta \approx 150^\circ$

Image analysis with Matlab and ImageJ

Results
- Bubble cutting at various conditions ($d_c = 4$ mm)
- Bubble size and velocity affect film thickness during cutting
- Formation of satellite bubbles during breakup of large bubbles
- Experimental recordings (side view)
- Numerical simulation, bottom view [6]

Conclusions
- Separation of bubbles and cylinder by a uniform liquid film
- No influence of cylinder wettability on bubble cutting process