



Mass Transfer Enhancement as a Function of Oscillatory Baffled Reactor's Design

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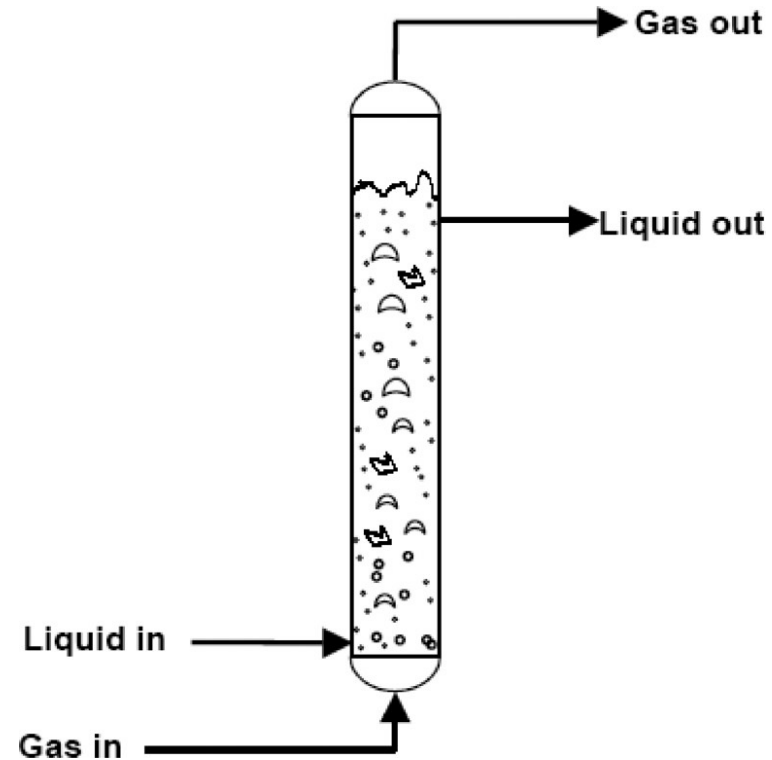
Bubble column

Advantages:

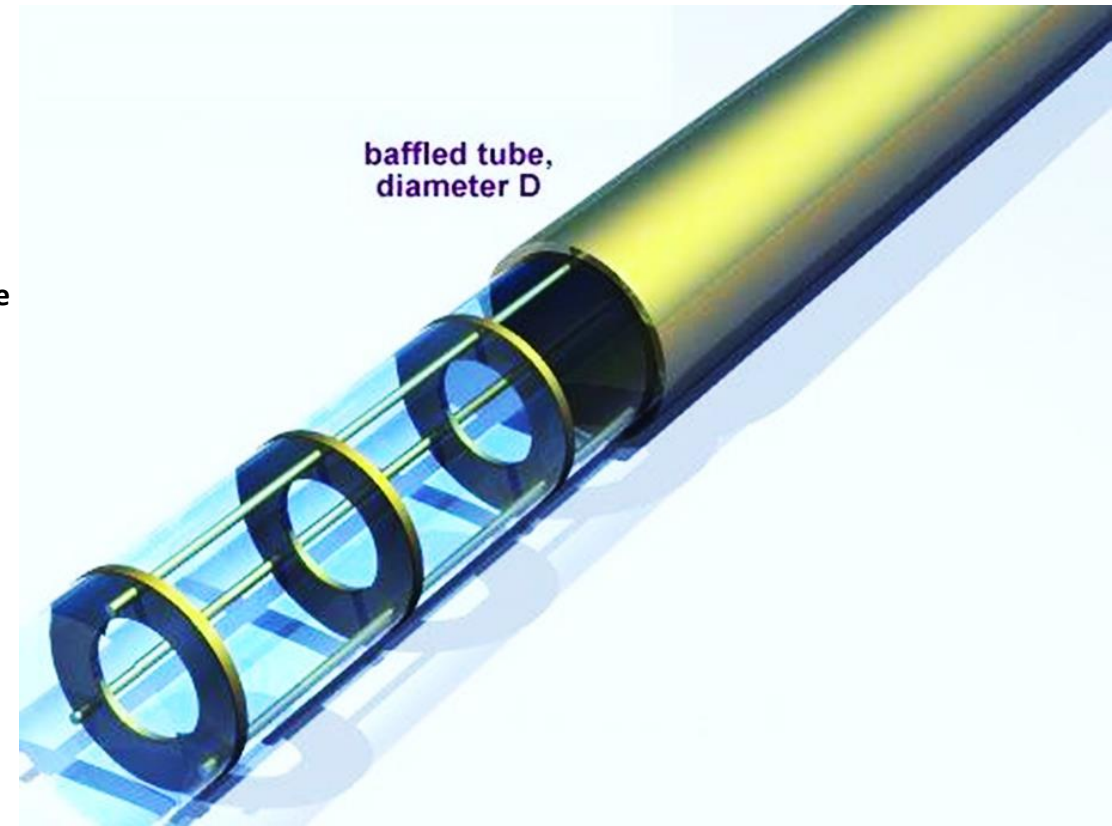
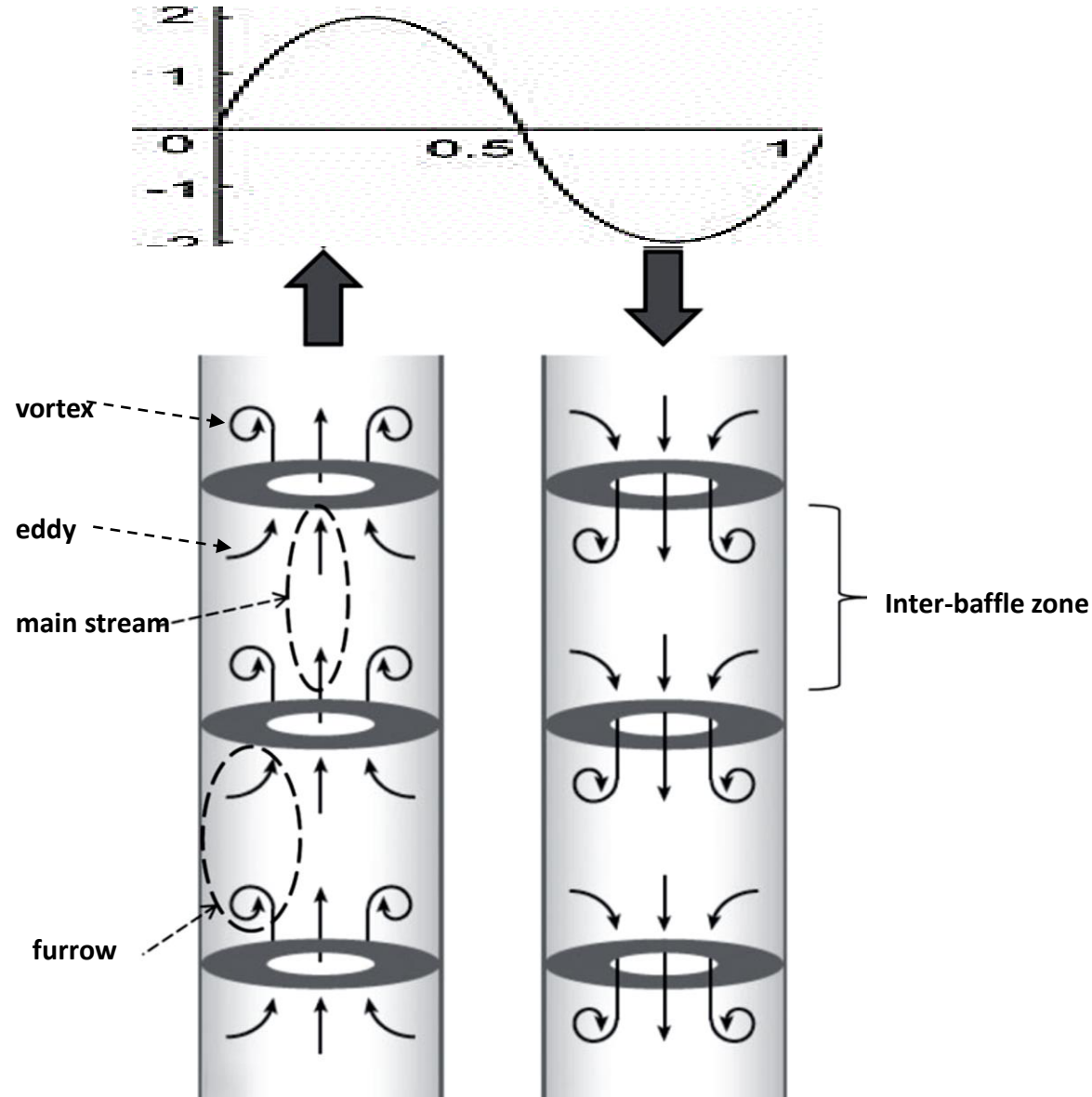
- ✓ Good heat and mass transfer
- ✓ no moving parts
- ✓ ease of operation
- ✓ low operating and maintenance costs.

Disadvantages:

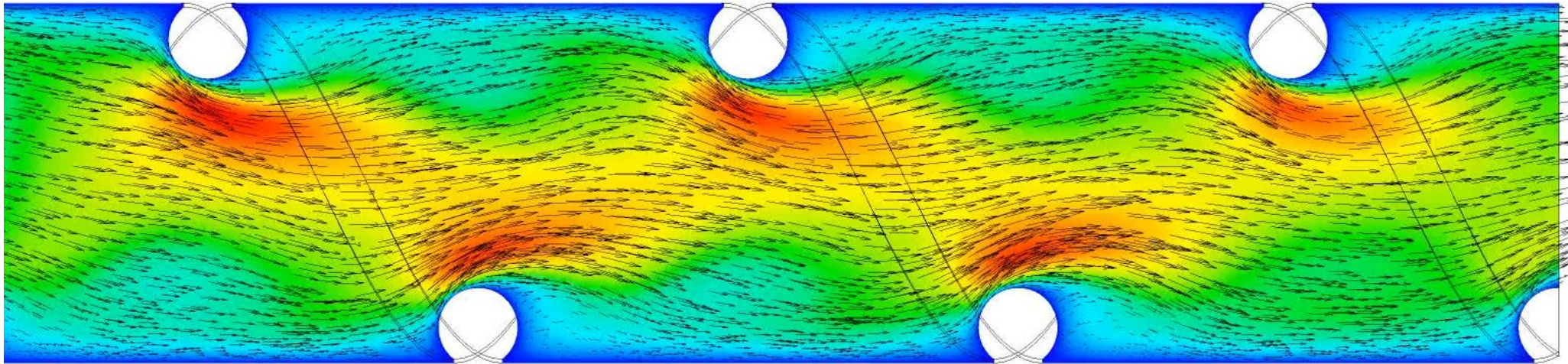
- Controlling the bubble/drop size distribution
- Product quality
- Scale up



Oscillatory Baffled Reactor (OBR)



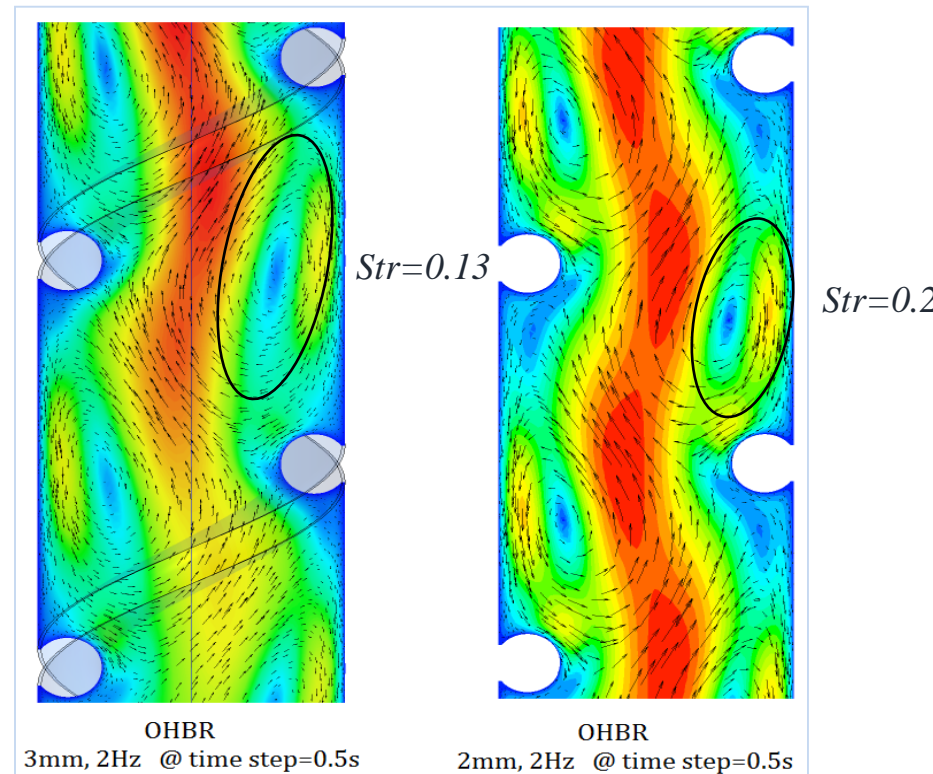
Oscillatory Baffled Reactor (OBR)



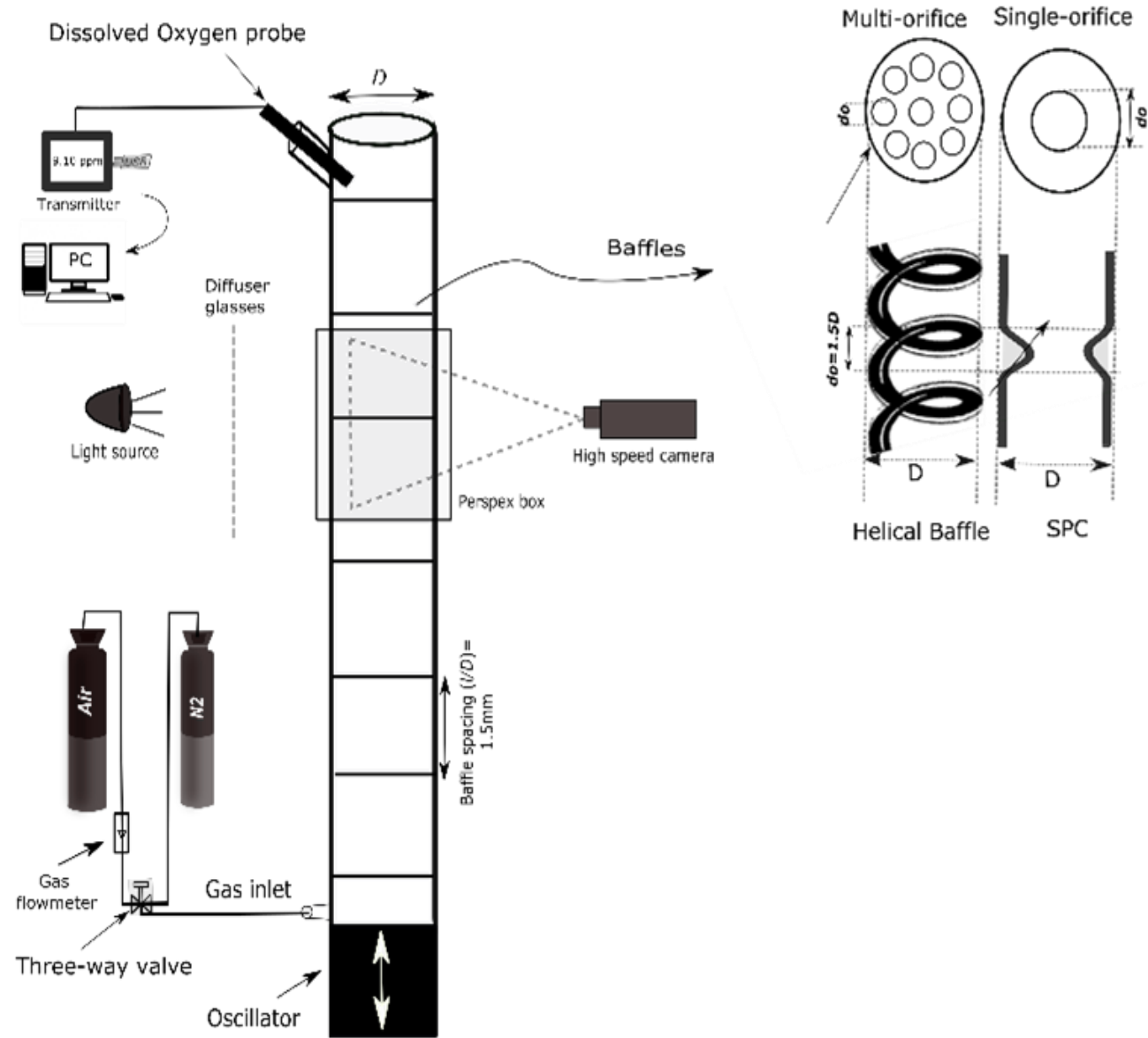
Dimensionless groups

Net flow Reynolds No. (<i>Ren</i>)	$\frac{\rho u D}{\mu}$
Oscillatory flow Reynolds No. (<i>Reo</i>)	$\frac{\rho 2\pi f x_o D}{\mu}$
Strouhal No. (<i>Str</i>)	$\frac{D}{4\pi x_o}$

f is the oscillation frequency (Hz)
x_o is the oscillation amplitude (mm)

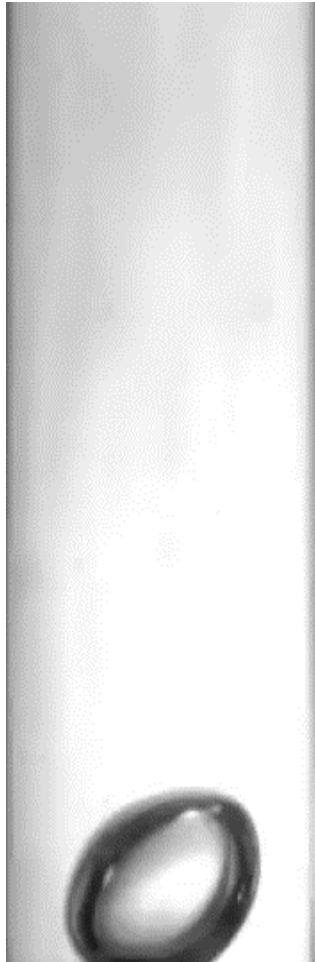


Devices and Methods

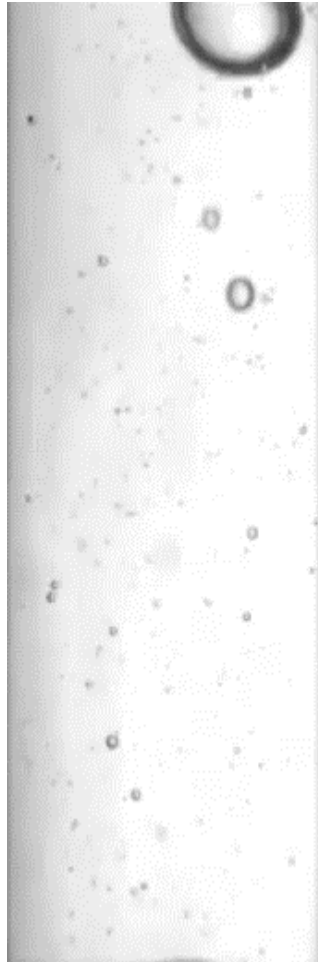


Flow visualisation

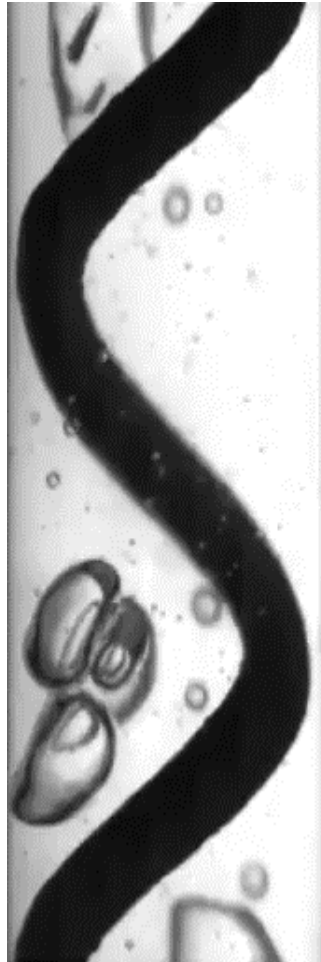
Bubble column



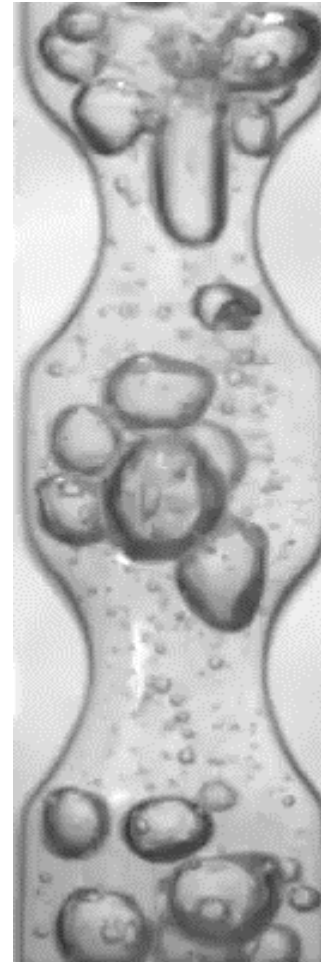
Oscillatory reactor (OR)



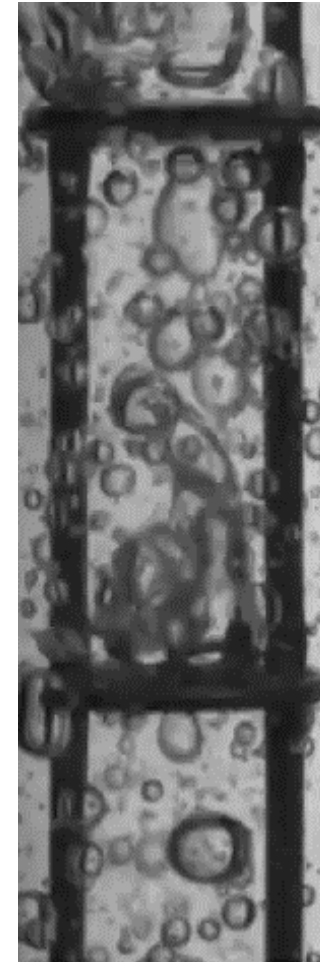
Oscillatory helical baffled reactor (OHBR)



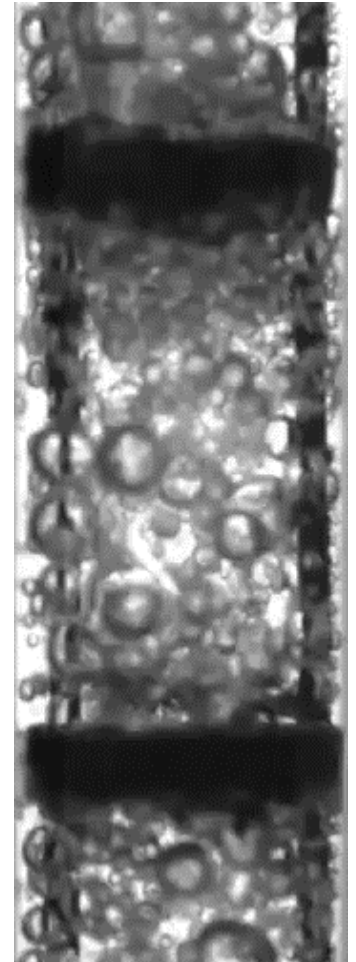
Oscillatory integral baffled reactor (OBR-SPC)



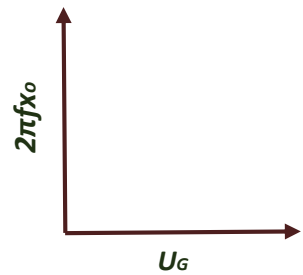
Oscillatory single-orifice baffled reactor (OSOBR)



Oscillatory multi-orifice baffled reactor (OMOBR)

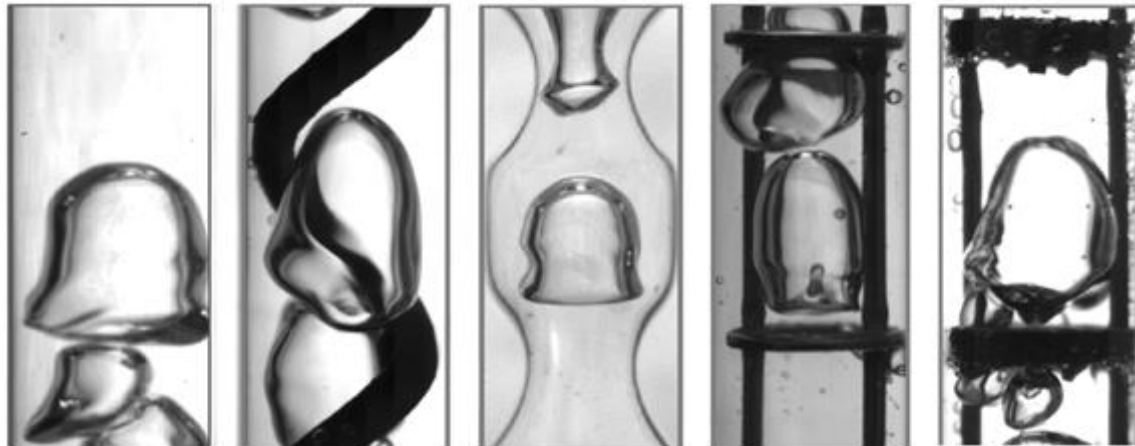


8mm, 8HZ

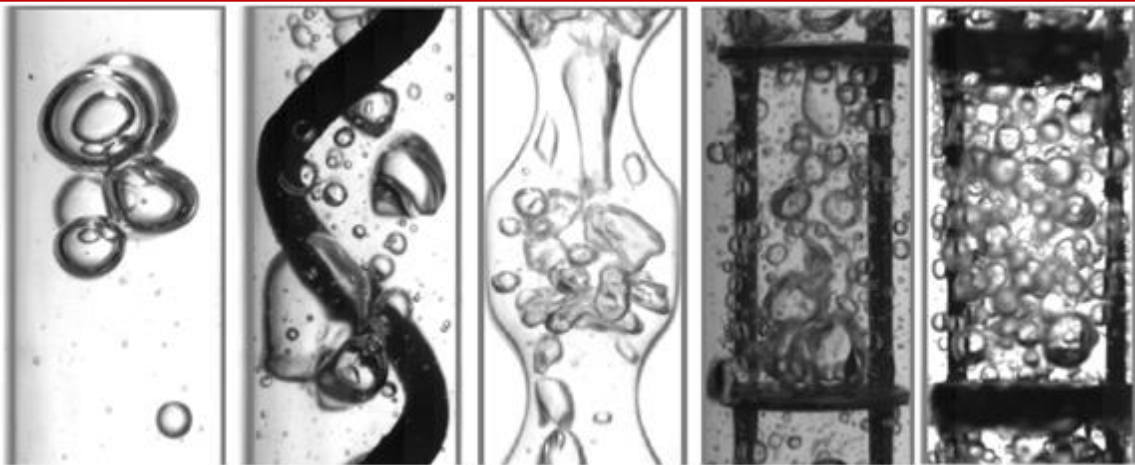


Flow regimes

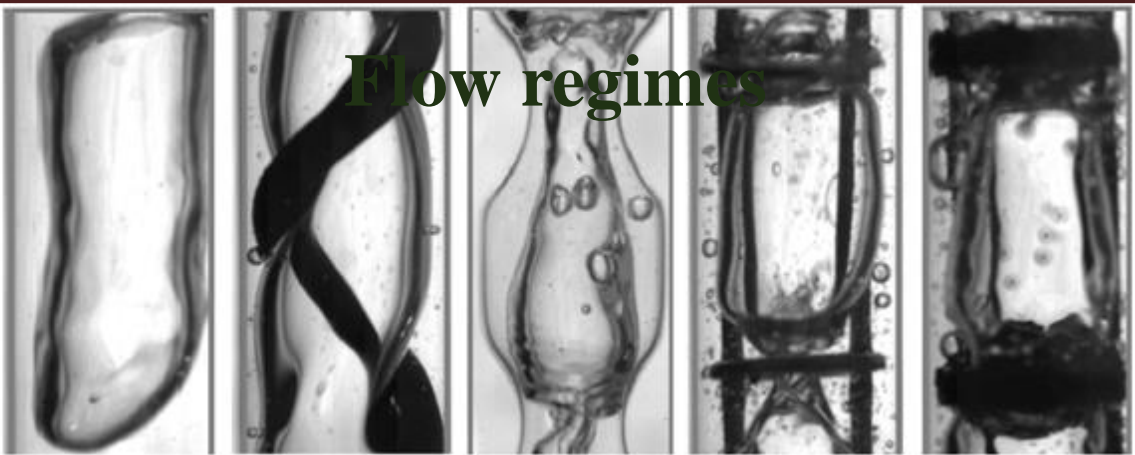
Slug flow



Bubbly flow



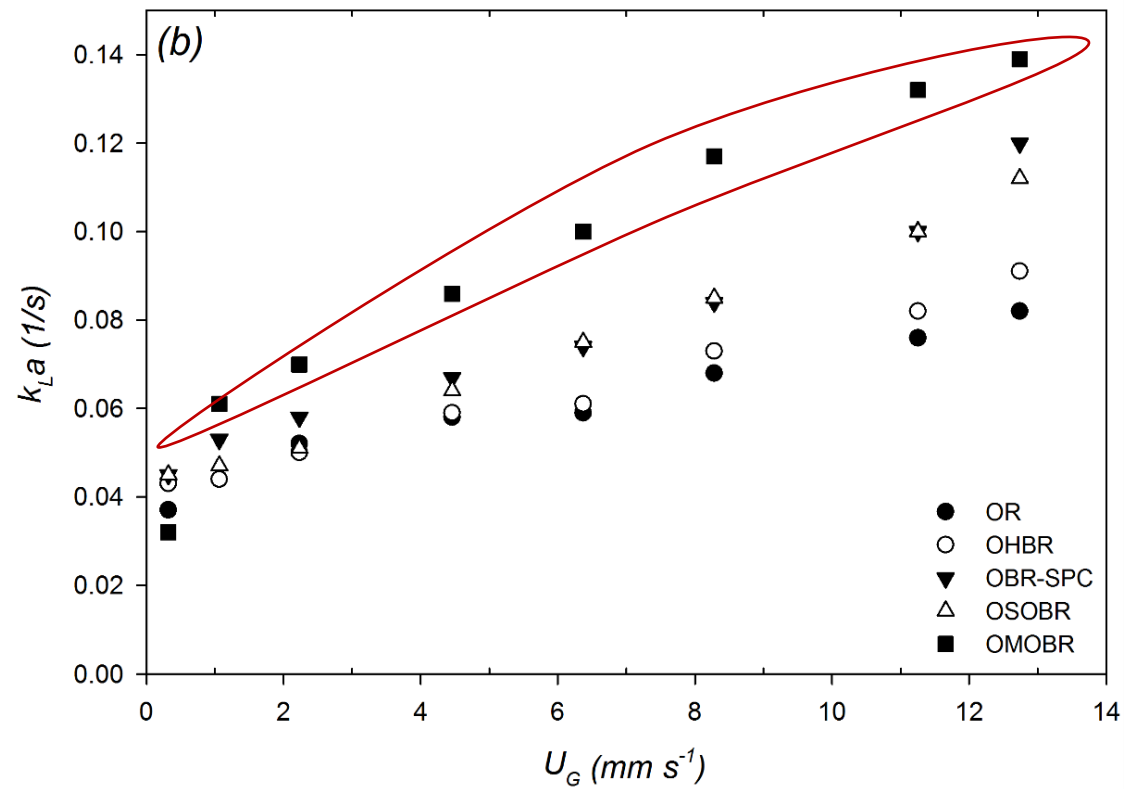
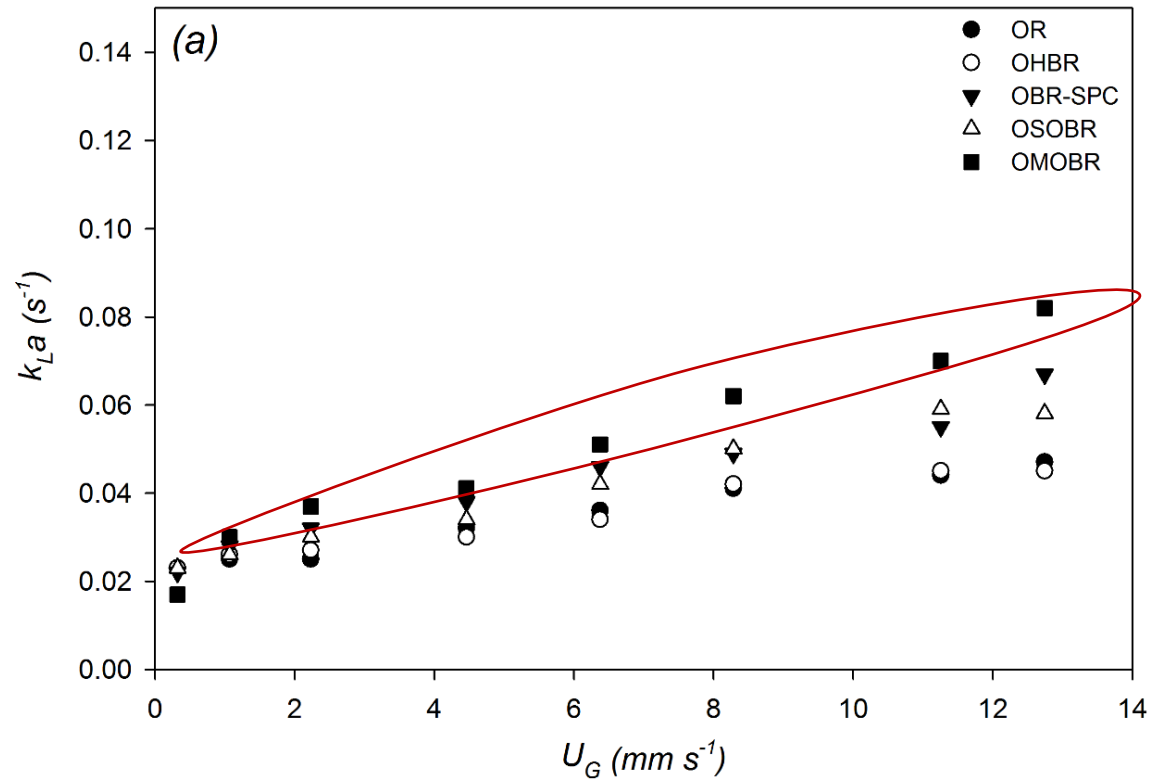
Churn flow



Quantitative results ($k_L a$)

without oscillation

with oscillation (6mm, 8Hz)



Thank you