

Water and bubbles

Looking for future collaborations

November 18th 2020

David Fernández Rivas

ByBCLEAN

MESA+
INSTITUTE

DESIGN
LAB

TECHMED
CENTRE

Kennispark Twente
Where science becomes business!

NovelT

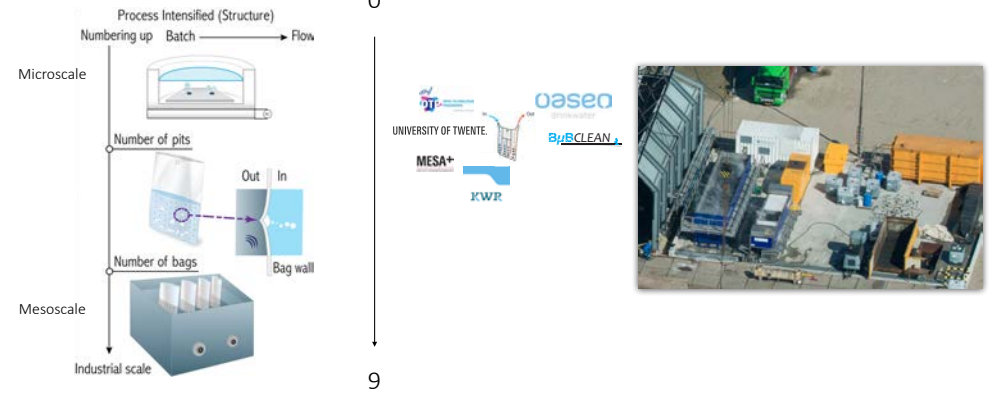
Ink&Beams

UNIVERSITY
OF TWENTE.

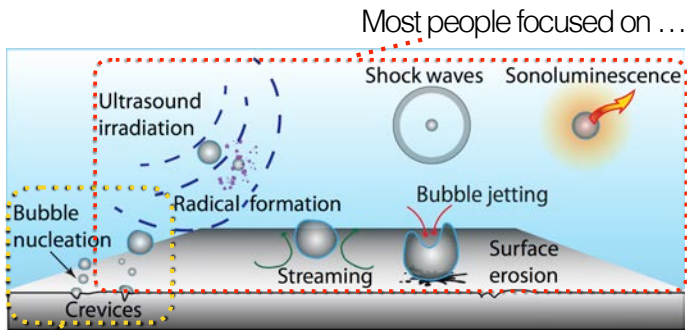
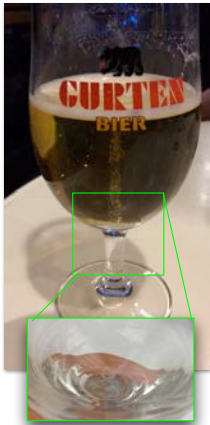
MIT

Ultrafast progress !

TRL
(Technology Readiness Level)



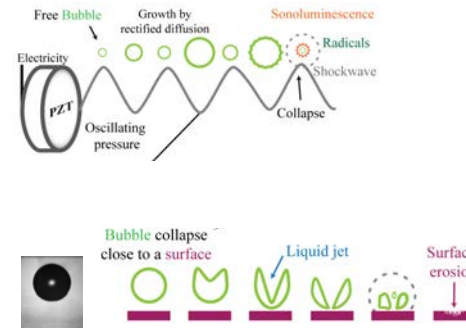
"Bottoms up!"



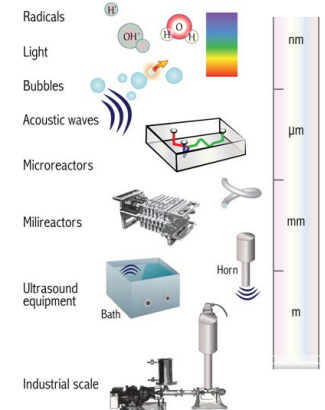
We focused on ...

Fernandez Rivas, et al., Chemical Communications. 48 (89), 10935 - 10947 (2012).

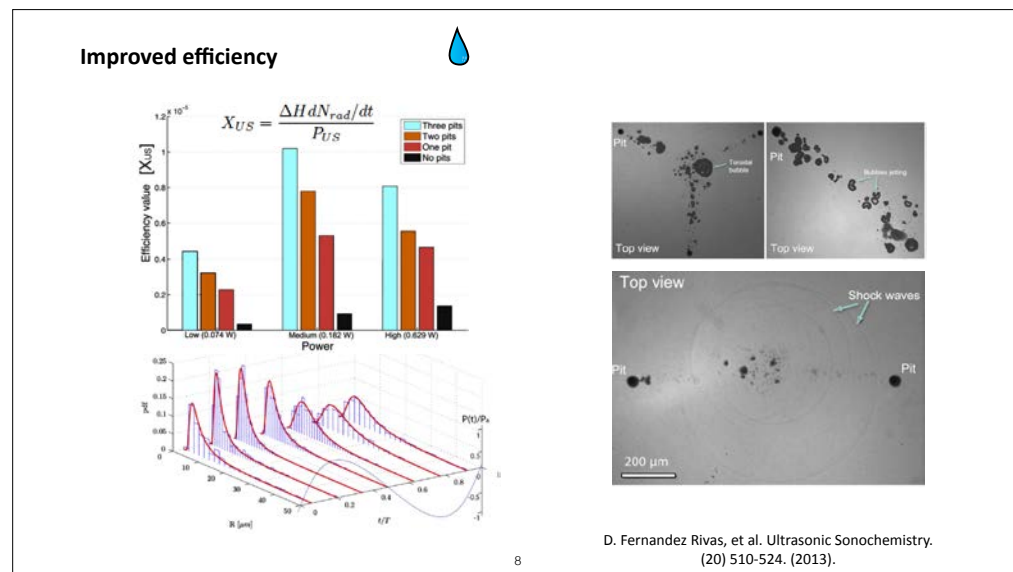
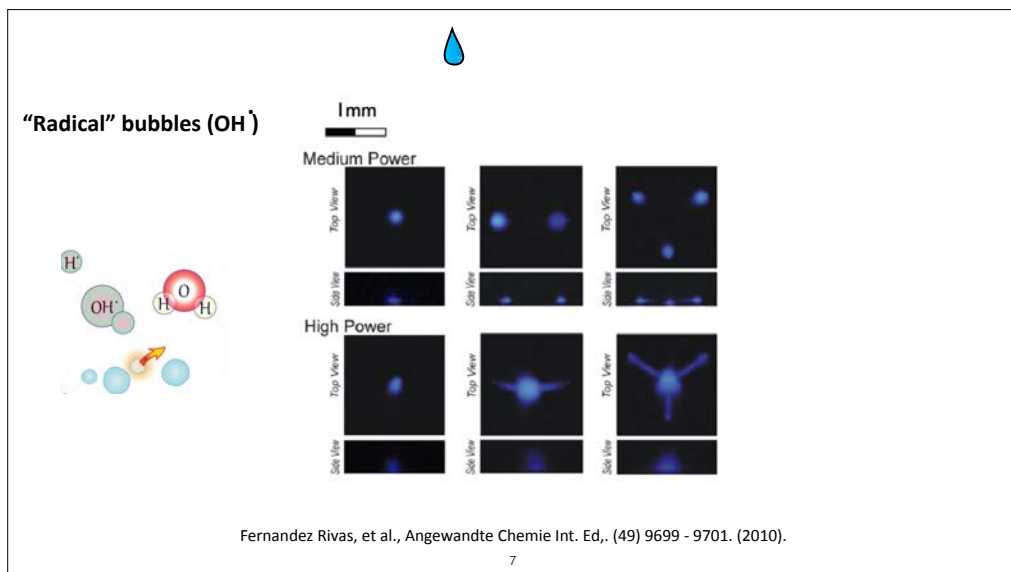
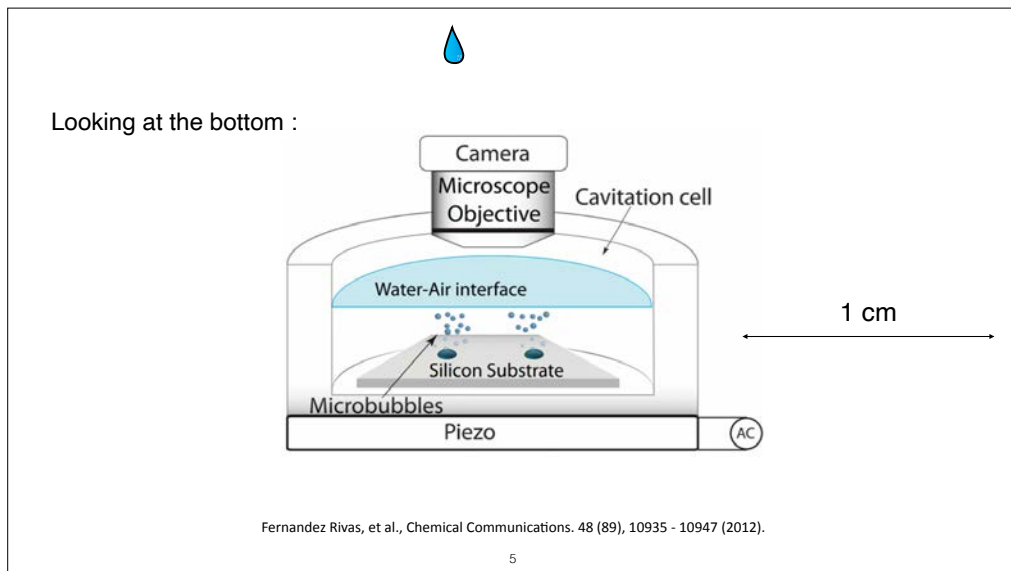
Let's look closer



Video: C.D. Ohl



Fernandez Rivas, D. & Kuhn, S. Top Curr Chem (Z) (2016) 374: 70.



Small advertisement
(sorry)



Bubble bags
+35.000 Sold!



Patented technology



But don't buy until
you see if it works
or not
with your own eyes!

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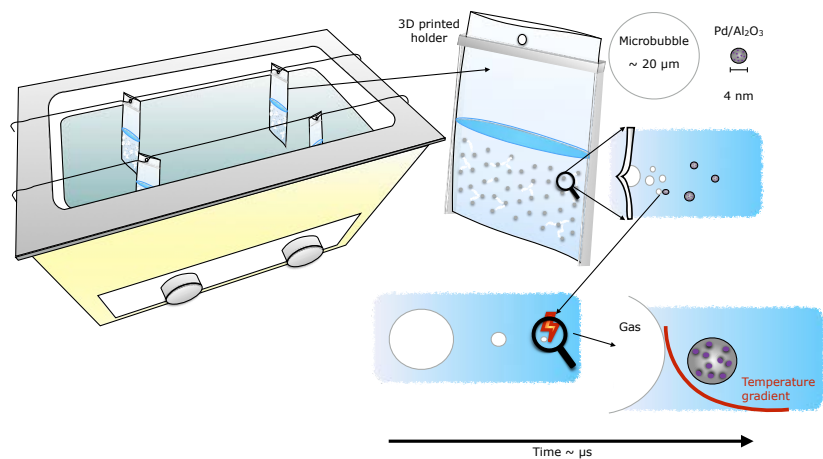


BuBble bags

BuBCLEAN

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Cavitation intensifying bags improve ultrasonic advanced oxidation with Pd/Al₂O₃ catalyst

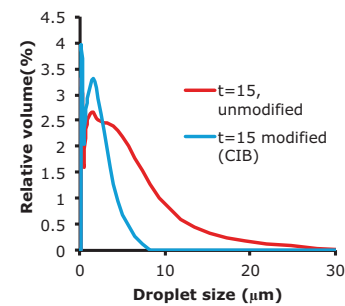


M. Pappalterra et al. Ultrasonics Sonochemistry 70 (2020) 105324

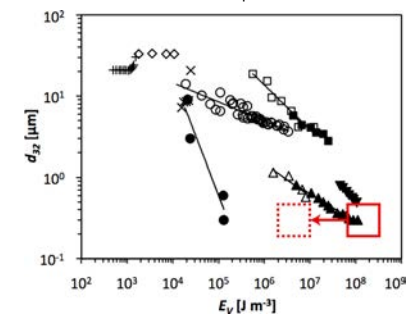


Emulsification in a bag

Hexadecane in water emulsions (15%, 1% SDS).
@ 37 kHz and 20 °C



Comparison of energy density of different emulsification techniques.



R. van Zwieten et al. / Ultrasonics Sonochemistry 36 (2017) 446–453

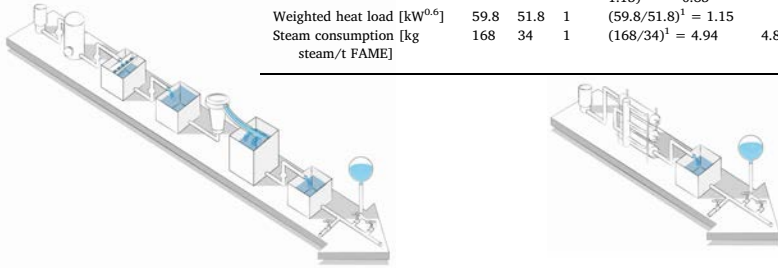
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How to compare (?)

Calculation of intensification factor for traditional water purification versus One-Step Reverse Osmosis.

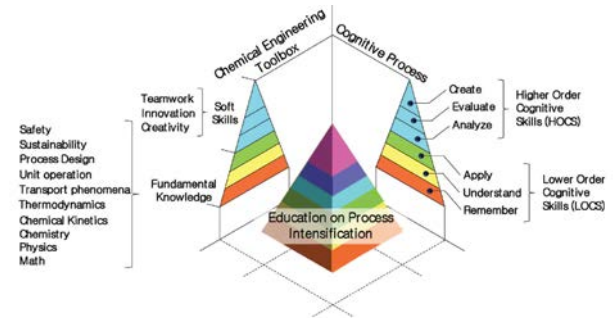
Factor	B	A	d	Fraction	IF_{total}
Column volume [m ³]	0.94	1.13	0.85	$(0.94/1.13)^{0.85} = 0.85$	
Weighted heat load [kW ^{0.6}]	59.8	51.8	1	$(59.8/51.8)^1 = 1.15$	
Steam consumption [kg steam/t FAME]	168	34	1	$(168/34)^1 = 4.94$	4.83



Evaluation method for process intensification alternatives
Fernandez Rivas et al. Chem. Eng. & Proc. Process Intensification 2017

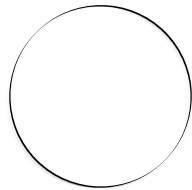


Process Intensification - Education



"Process intensification education contributes to sustainable development goals: part 2." Education for Chemical Engineers 32 (2020): 15-24

Thank you for your time



... many collaborators



more on
www.david-fernandez-rivas.com

