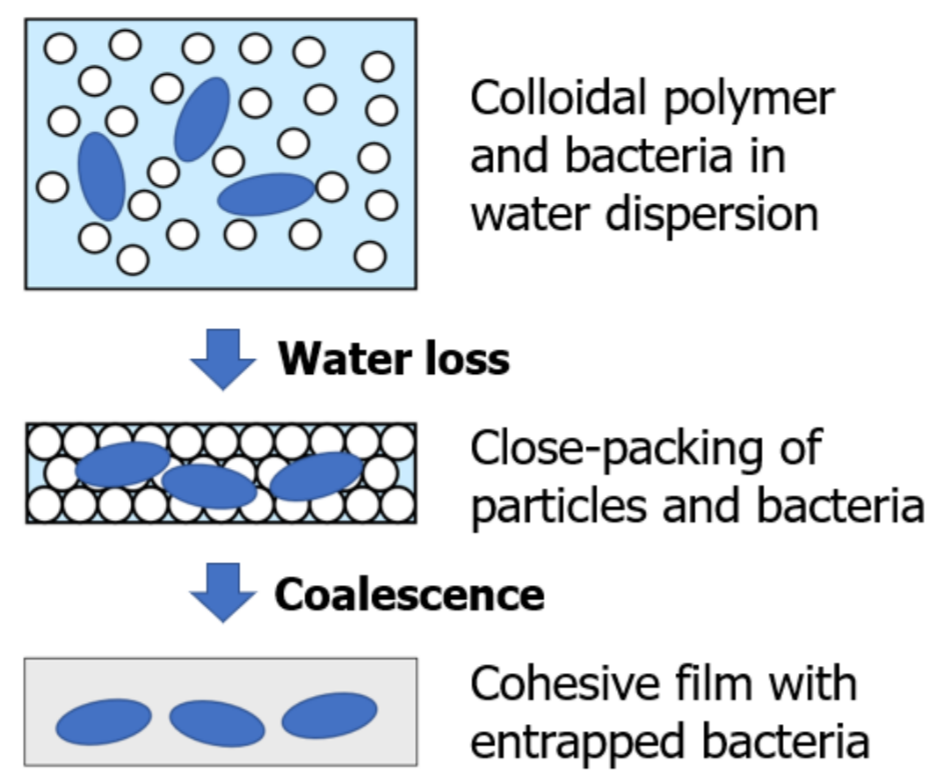
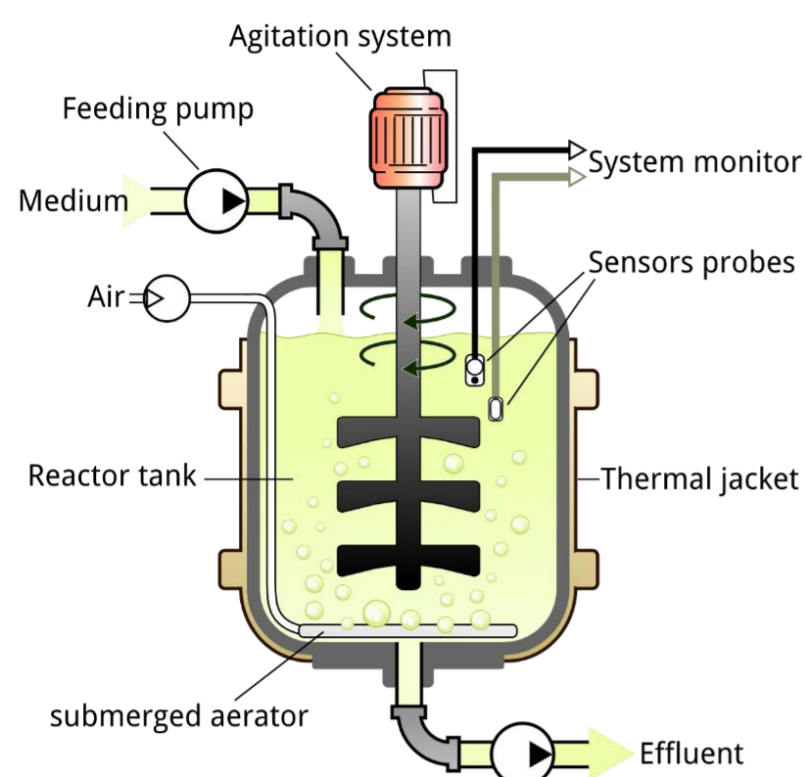


# Introducing Porosity in Colloidal Biocoatings for Functional Biocatalysis

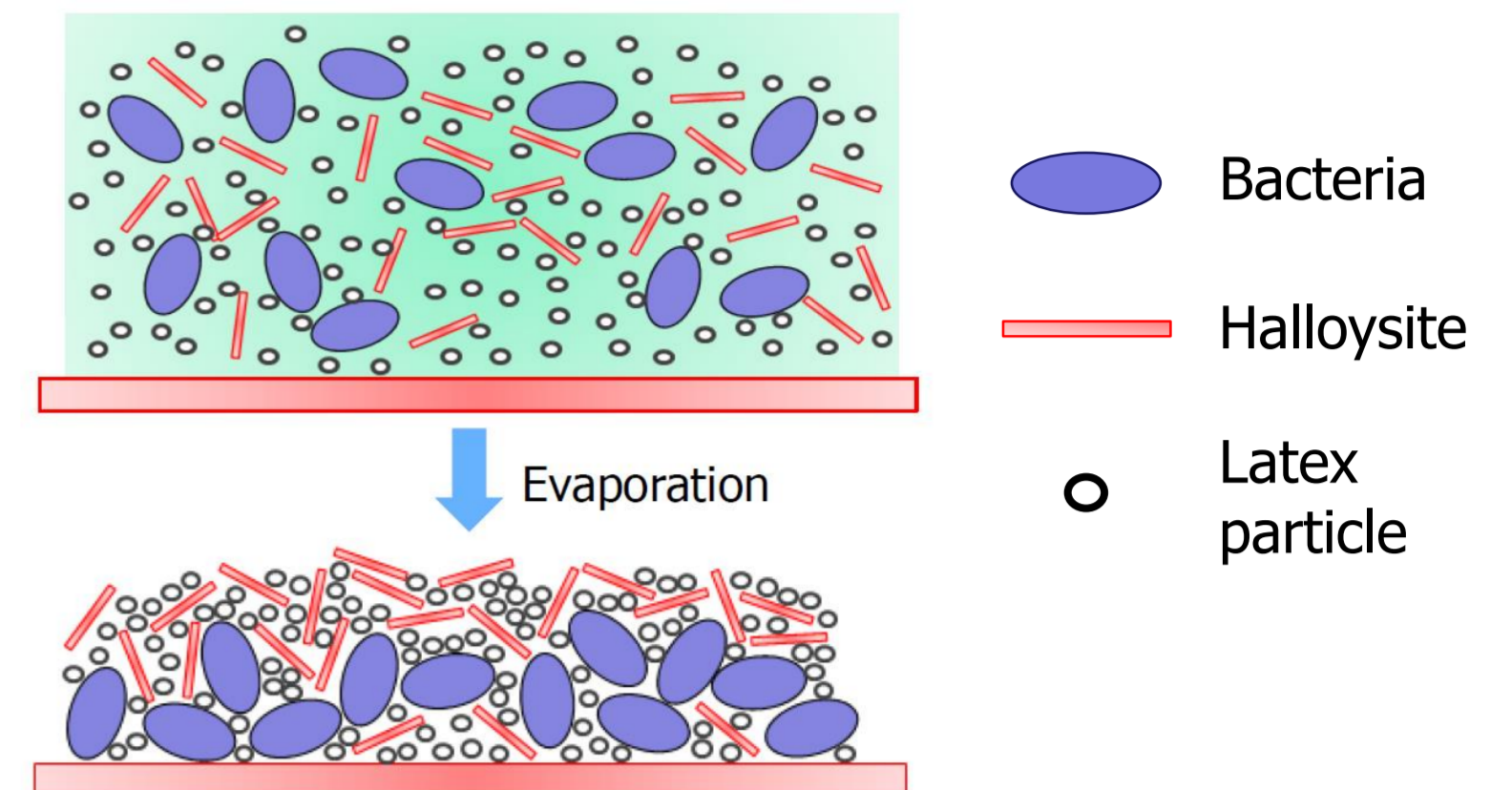
Yuxiu Chen, Simone Krings, Joshua R. Booth, Stefan A. F. Bon, Suzie Hingley-Wilson, Joseph Keddie

## What is a biocoating?



**Challenge in conventional bioreactor:** uncontrollable bacteria density, difficulty in separation of bacteria and final products, etc.  
**Solution:** physical separation of bacteria from the liquid phase by immobilising the bacteria inside a porous material.  
**Biocoating:** a material that employs a colloidal polymer film to confine non-growing, metabolically-active bacteria.

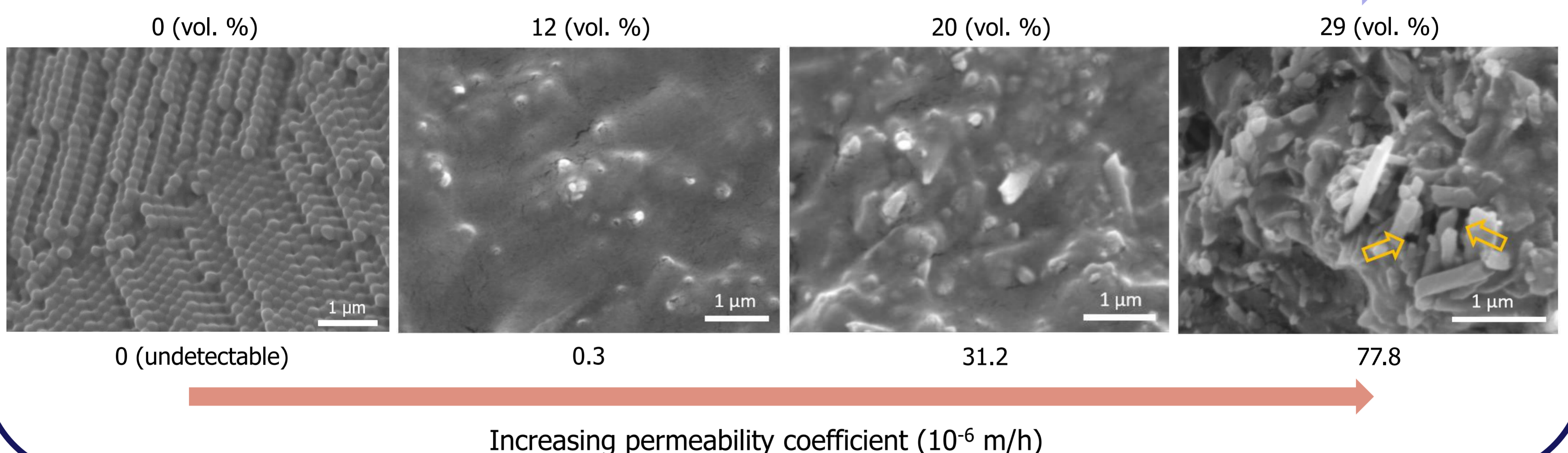
## Increasing porosity to biocoating by adding halloysite



Porosity can be created by in-efficient packing of halloysite

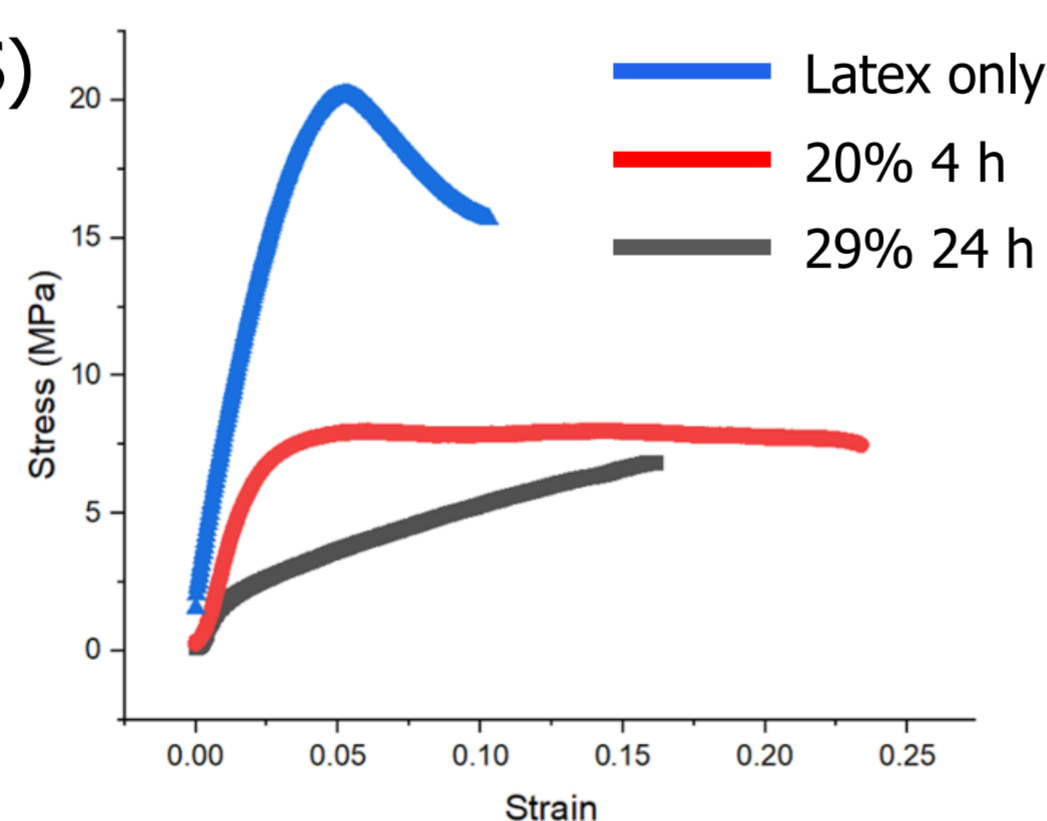
## Morphology and permeability coefficient of the halloysite composite coatings

Increasing halloysite concentration



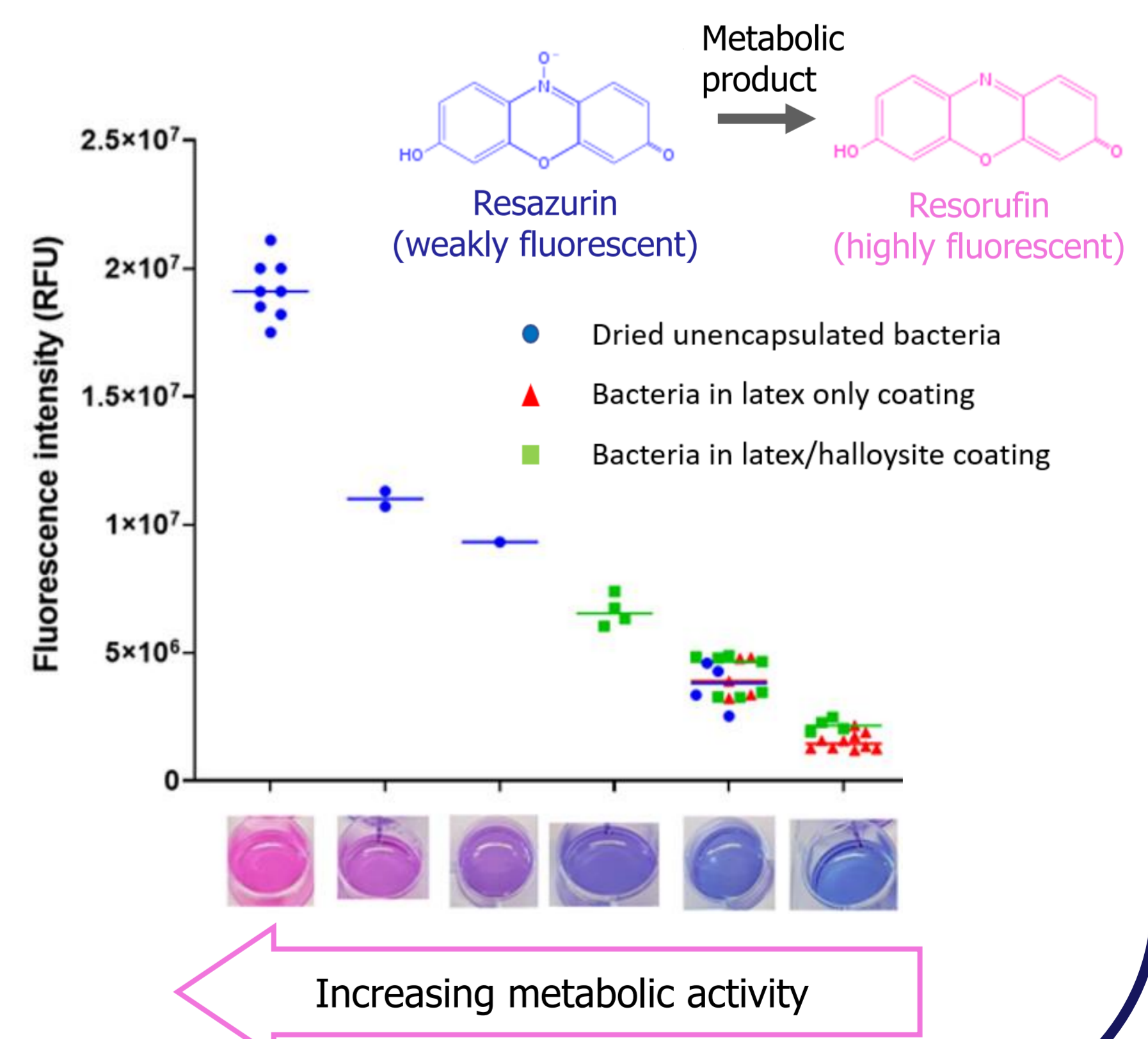
## Mechanical properties of the halloysites composite coatings

- Ultimate tensile stress (UTS) decreases with increasing halloysite concentration (more porous)
- UTS increases with increasing film formation time (less porous)



Halloysite concentration	Film formation time (h)	Breaking strain (%)	Ultimate stress (MPa)	Permeability coefficient ( $10^{-6}$ m/h)
0 (vol. %)	4	$8 \pm 6.7$	$15 \pm 6.2$	0 (undetectable)
12 (vol.%)	4	N/A	N/A	0.3
20 (vol. %)	4	$28 \pm 14.9$	$6 \pm 1.1$	31.2
29 (vol. %)	4	Too Brittle to be tested		77.8
29 (vol. %)	24	$10 \pm 3.6$	$5 \pm 1.7$	58.3

## Adding halloysite increases metabolic activity of bacteria inside biocoatings



## Acknowledgement

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## Reference

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2. Flickinger, M.C., et al., *Journal of Coatings Technology and Research*, 2017. **14**(4): p. 791-808.