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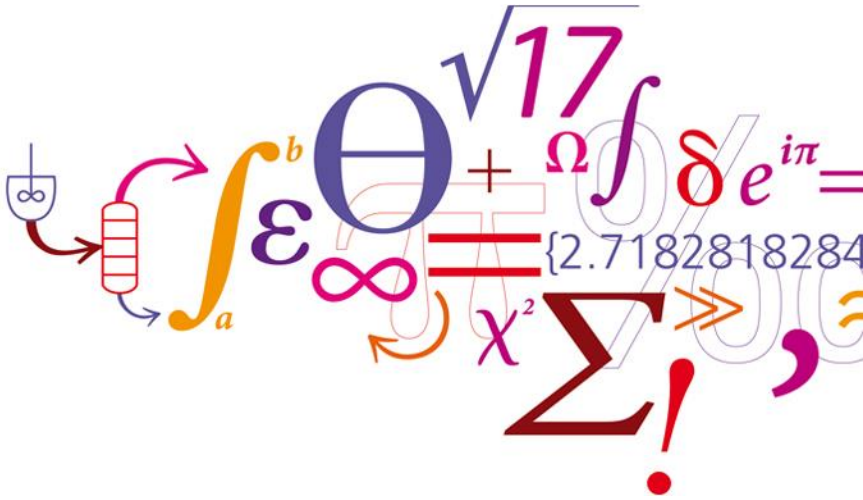
The Hempel Foundations Coating Science and Technology Center (CoaST)

Research areas at CoaST

- → Coating formulation and production principles
- → Fouling control coatings
- → Anti-corrosive coatings
- → Intumescent coatings
- → Functional coatings
- → Sustainable raw materials for coatings

Towards improved Antifouling:

Exploring Xanthan gum Hydrogel Coatings



Marcel Butschle, *Shawn Lindner, Markus Schackmann, Kim Dam-Johansen*
The Hempel Foundation Coatings Science and Technology Centre (CoaST)

VILF Tagung 2023

DTU Chemical Engineering
Department of Chemical and Biochemical Engineering


N
LEGE-
CAP-FERRET
FOREST
ARES
FOREST
ANDERNOS
Claouey
Le Petit Piquey
Le Grand Piquey
Taussat
Cassy
LANTON
Le Canon
BASSIN
D'ARCACHON
AUDENGE
L'Herbe
La Vigne
ARCACHON
ATLANTIC OCEAN
Belisaire
GUJAN-
MESTRAS
BIGANOS
CAP-
FERRET
LE TEICH
La Pointe
DUNE
DU
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LA TESTE
DE BUCH
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i
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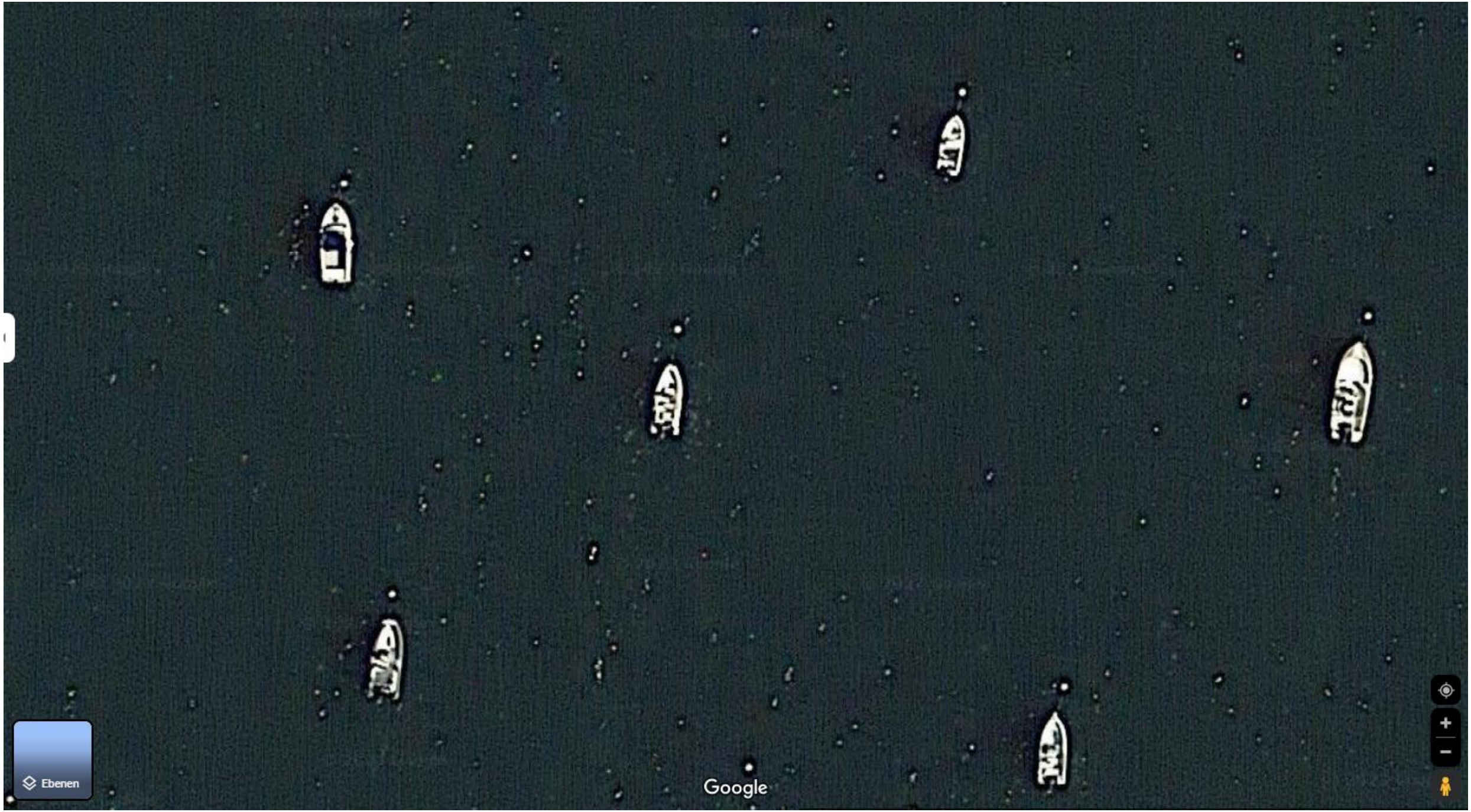
TO SANGUINET
Caudos
FOREST
FOREST
Etang de Cazaux
et de Sanguinet


Ebenen
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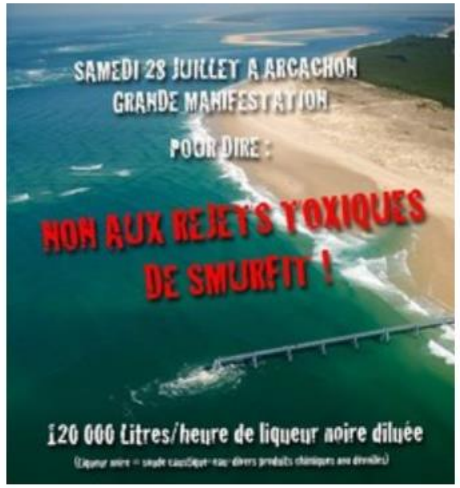
EL PALOMAR
Chapelle de la Villa Algérienne
Chez Magne - Hôtel de la Plage
vorübergehend geschlossen
Ô Canelon
Am besten bewertet
D106
Bd des Mimosas
cabane 171
L'Arkeseon
Carrefour Express
Aktuelles Angebot
Rue de l'Océan
ma balade en pinasse
Pinasse Tuanis
3678
boats in Arcachon Bay, releasing toxic copper

Marine Environmental Research 32 (1991) 7–17

[redacted]

The pollution and destruction of the Basin of Arcachon ecosystem, Aquitaine, France

Last update: 2020-12-24



Described as a "cocktail of pollution", the destruction by industry and overpopulation of the ecosystem of the the Arcachon Bay, a Ramsar site, is proceeding.

...nations + expand

PMID: 11007281 DOI: 10.1016/s0048-9697(00)00510-6

Save Email

Copp... role o...

Environm...

...oysters : ...s ...00510-6.

...e French experience

REPORTS

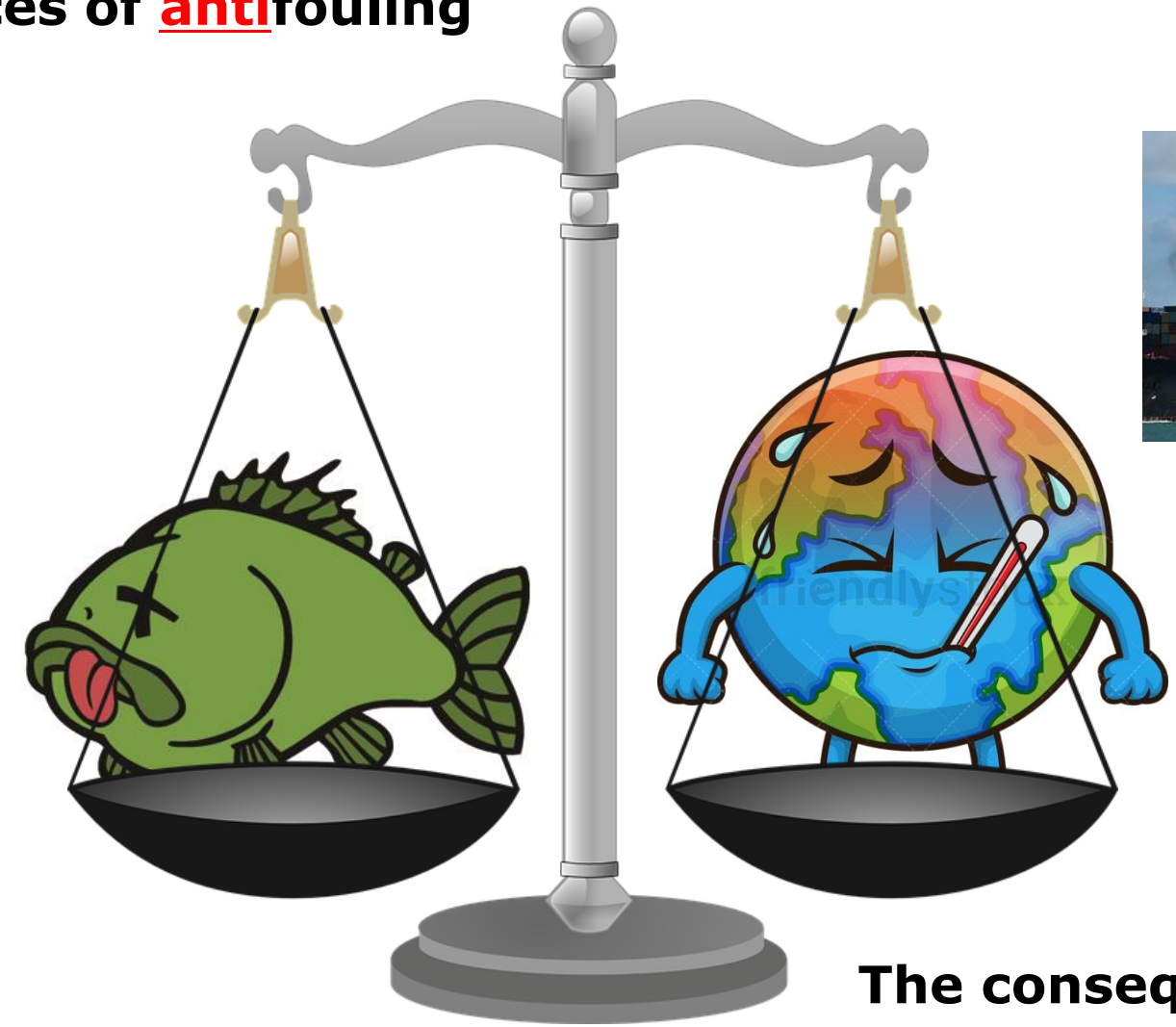
Marine Pollution Bulletin, Volume 17, No. 11, pp. 494–498, 1986. Printed in Great Britain.

Tin Contaminatio...

Effects on Oyster Sh...

CL. ALZIEU*, J. SANJUAN*, J. P. DELTRE...
*IFREMER Nantes, B.P. 1049, 44037 Nantes C...
†IFREMER Arcachon, Quai du Commanda...

The consequences of antifouling

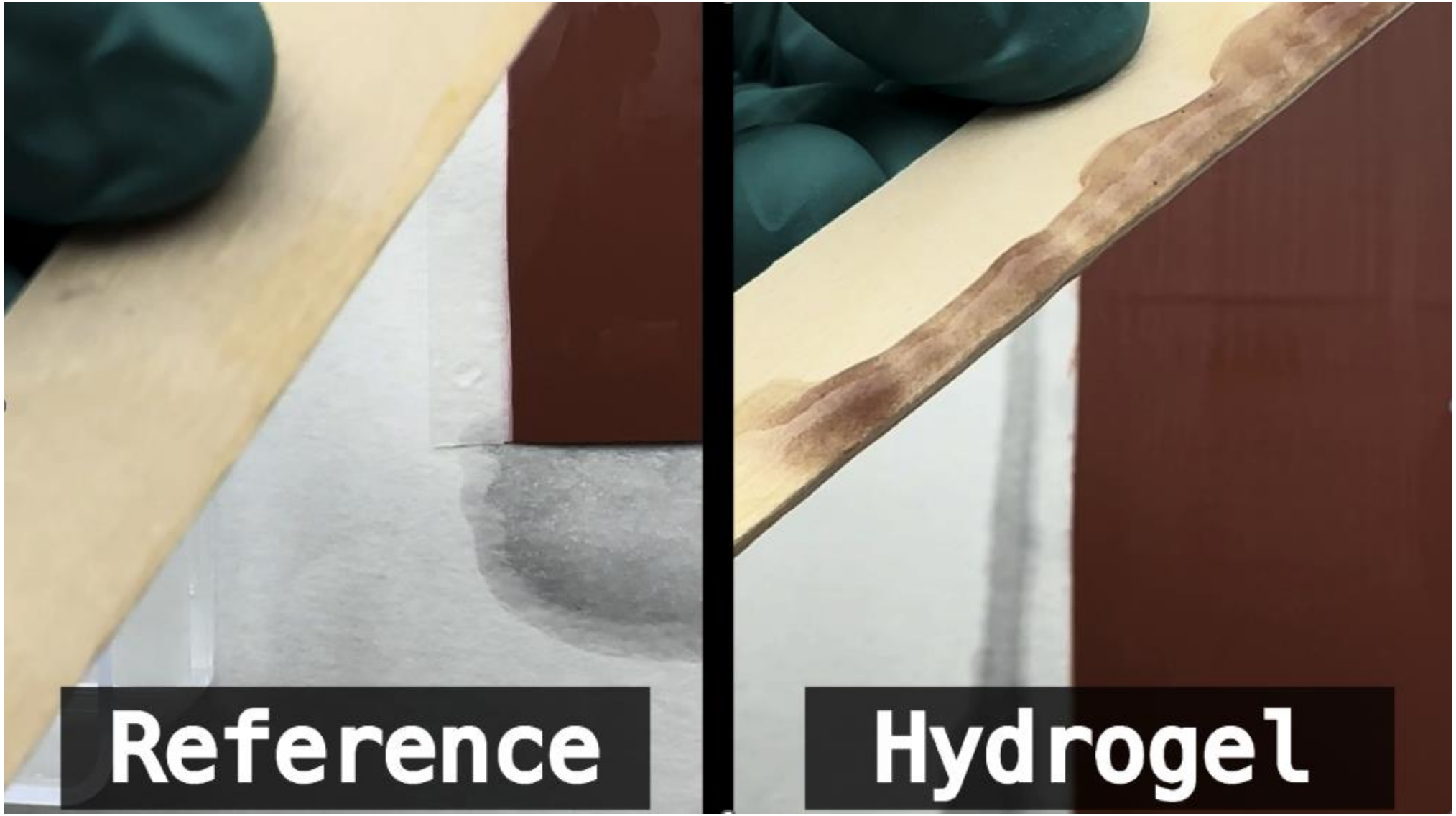


The consequences of fouling

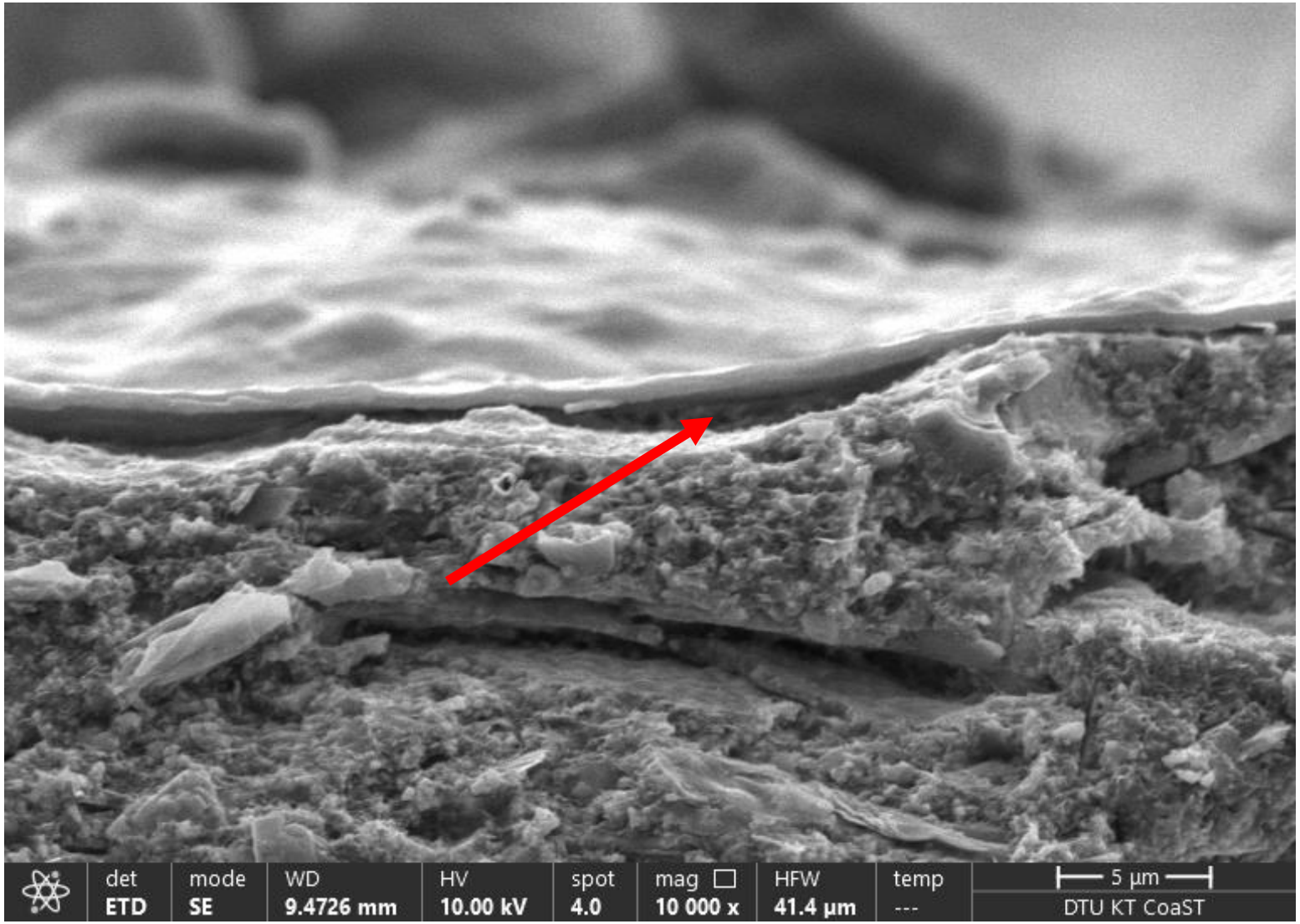
Release less

with Xanthan gum hydrogel coatings

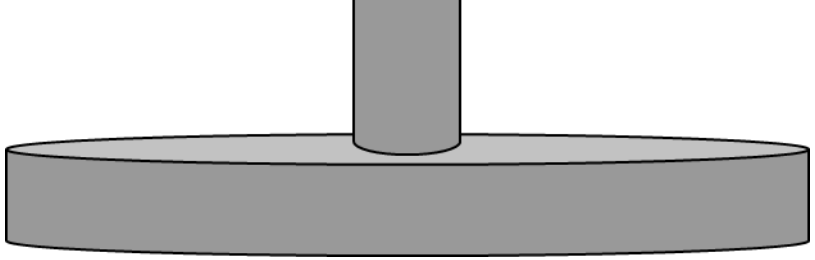
DTU Chemical Engineering, Technical University of Denmark

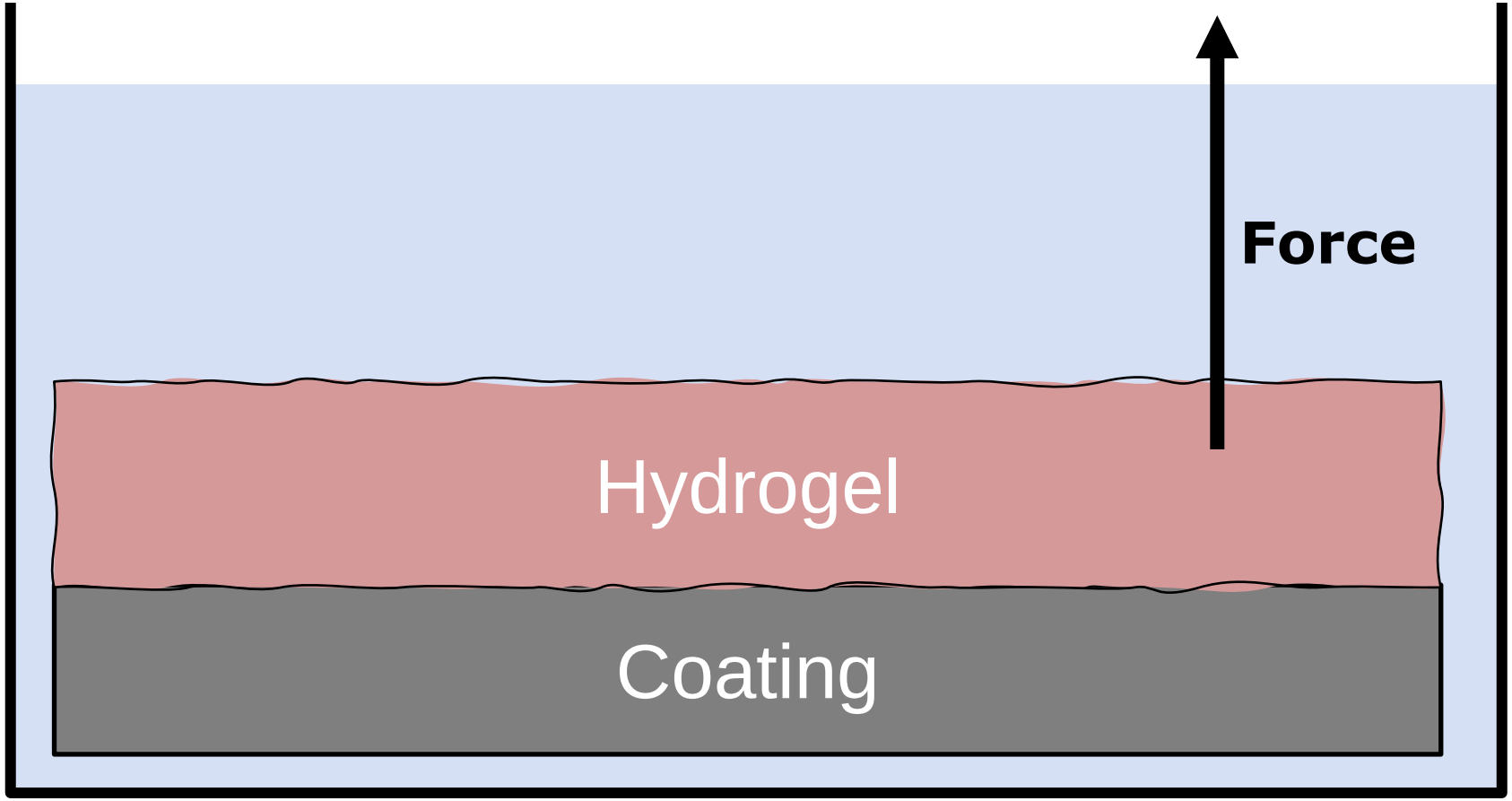

Reference
Hydrogel

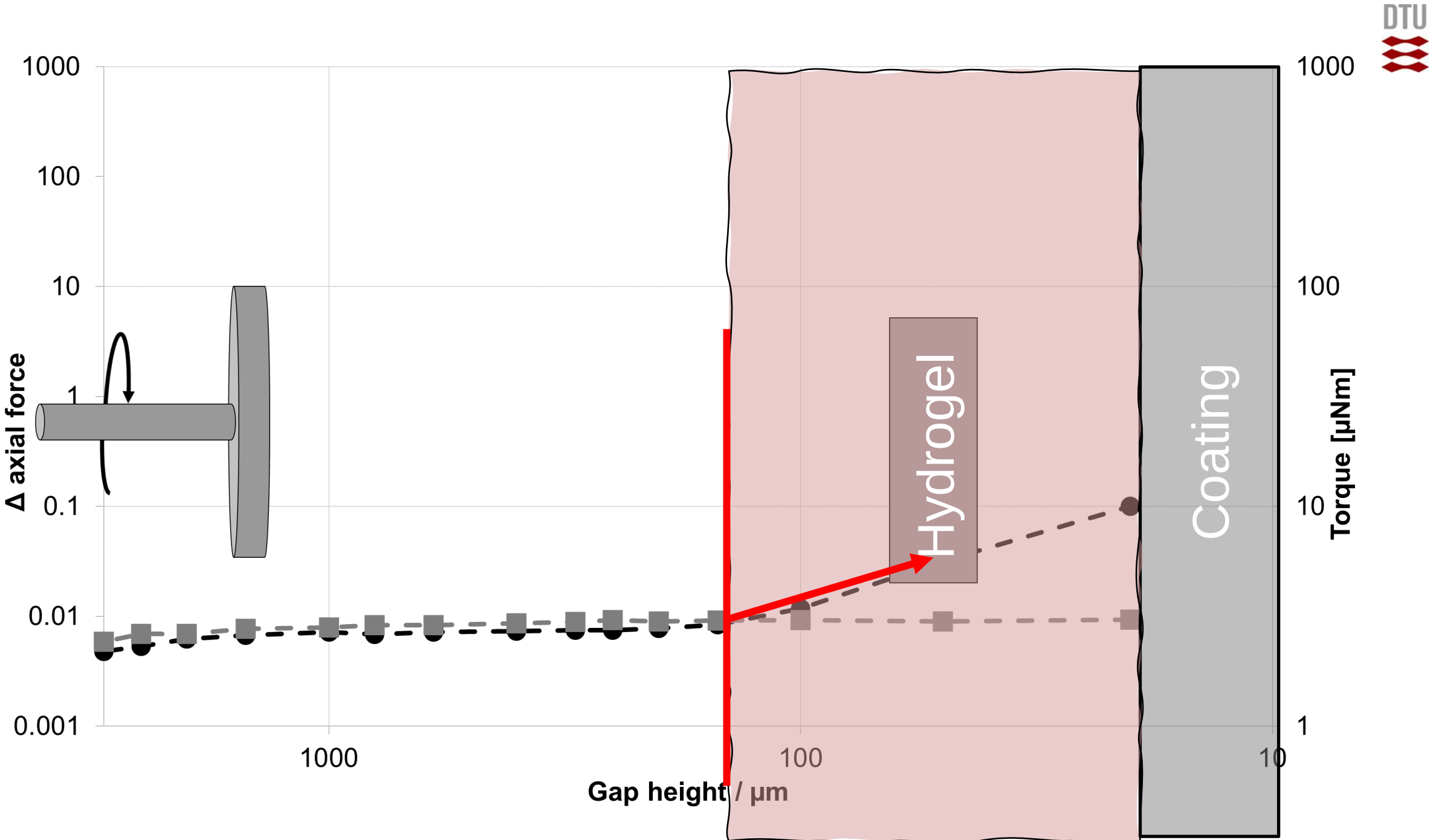
The gel layer under the SEM

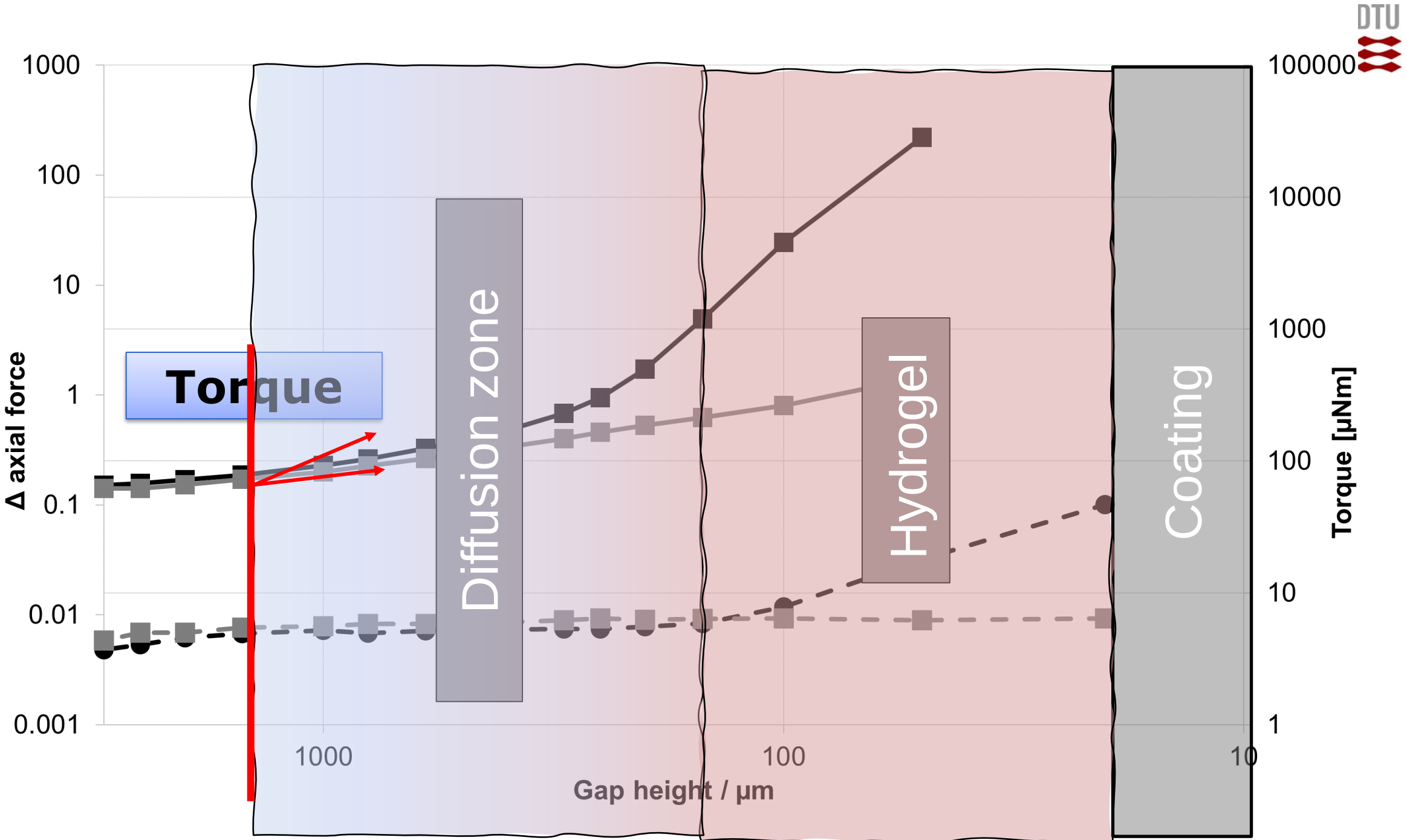


Rheometer






1000
100
10
1
0.1
0.01
0.001
Δ axial force
1000
100
10
Gap height / µm
1000
100
10
1
Torque [µNm]
Hydrogel
Coating


DTU
1000
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Δ axial force
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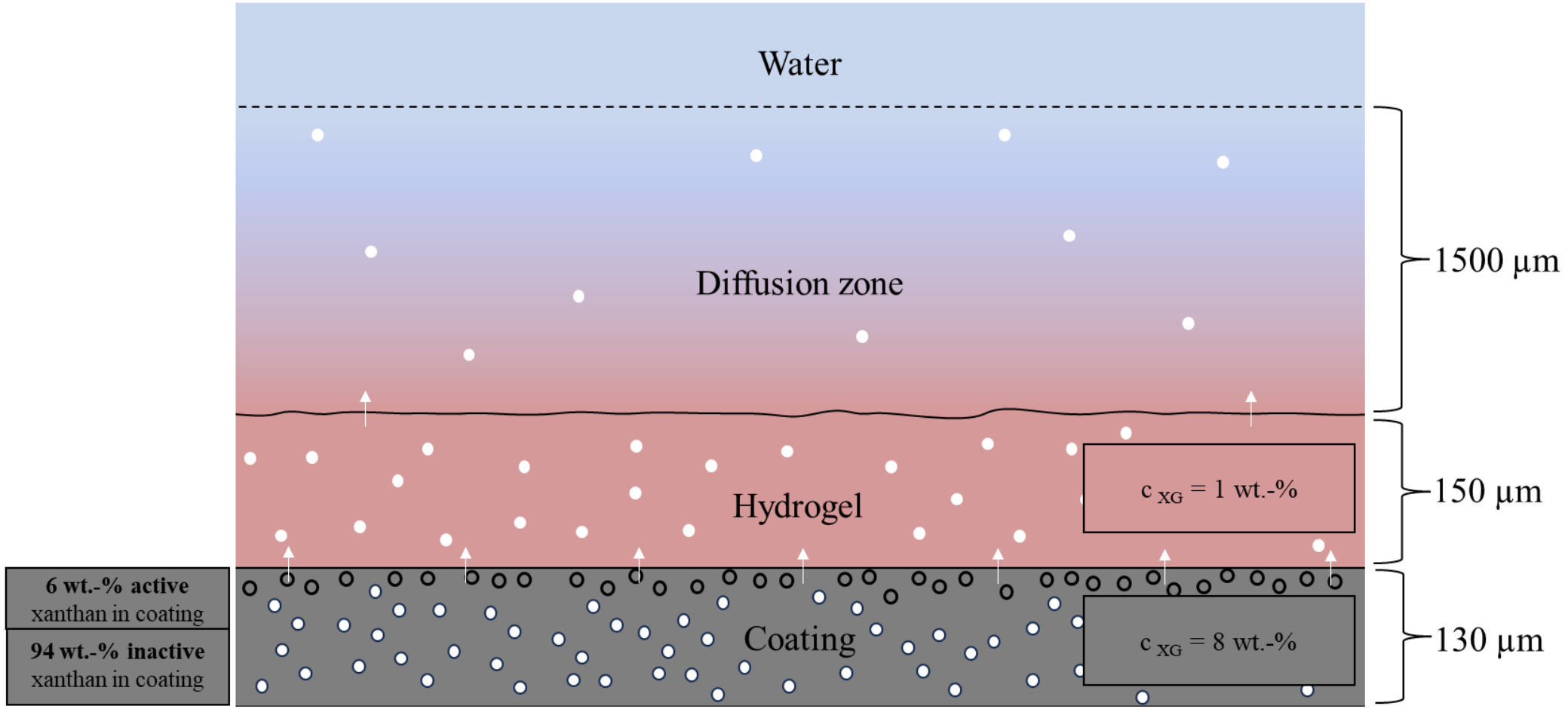
Torque [µNm]
Torque
Diffusion zone
Hydrogel
Coating
1000
100
10
Gap height / µm

Xanthan gum hydrogel coating structure



But what does the hydrogel do?

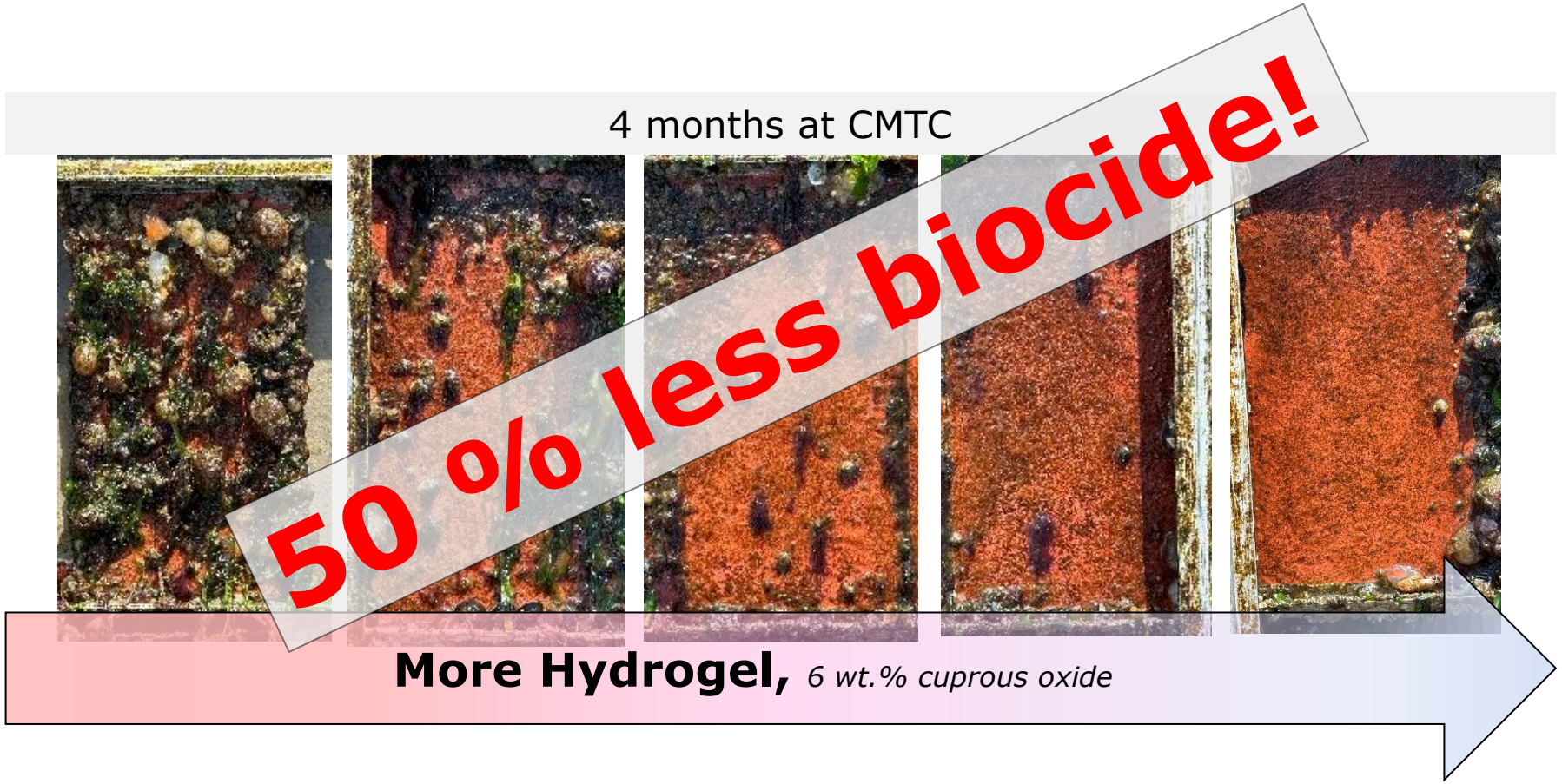
Biocide-free

6 weeks at CMTC

no hydrogel

hydrogel

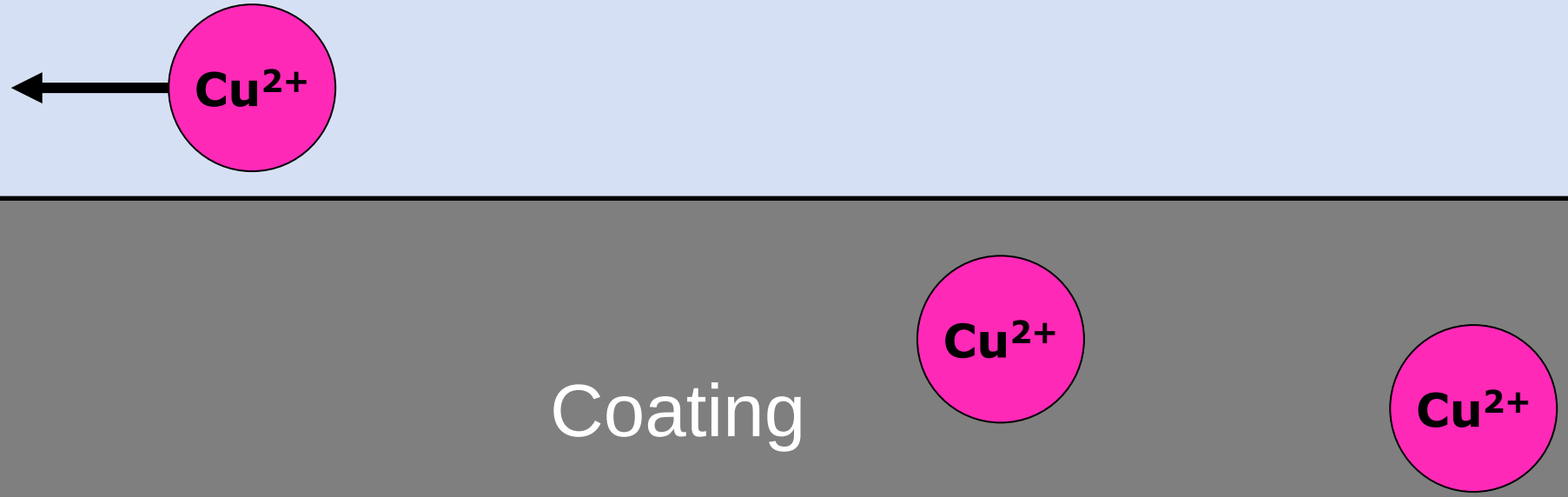
BUT with biocide…



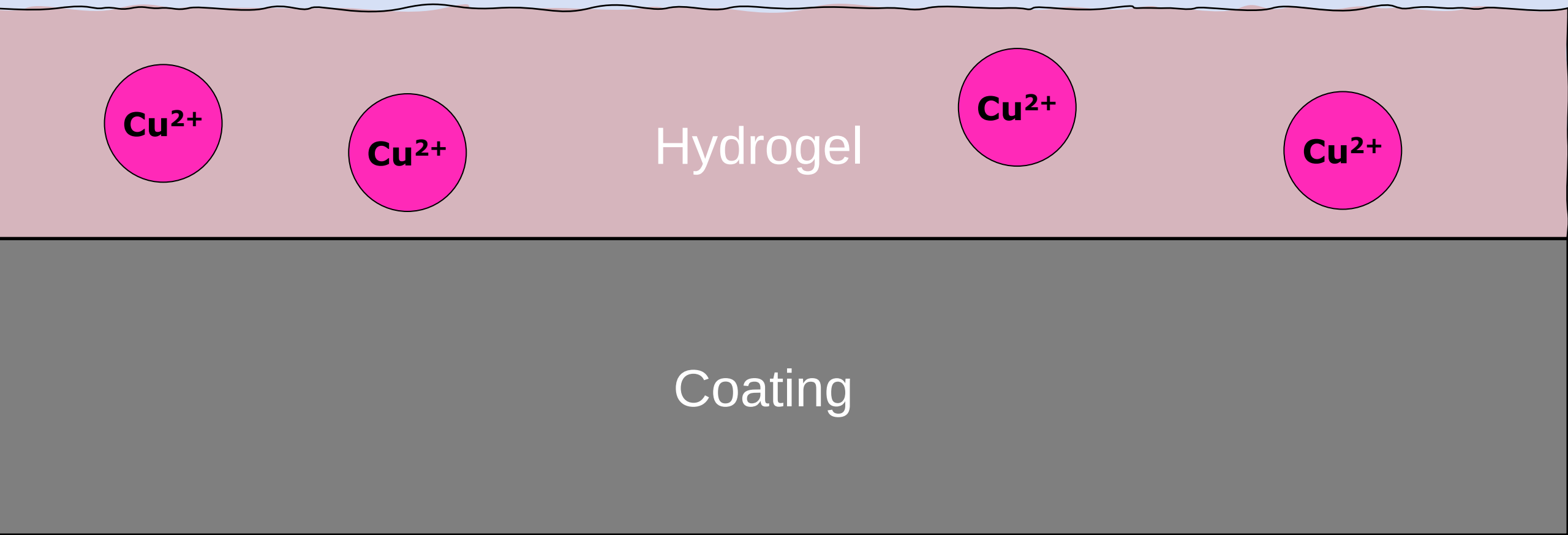
Why?

Higher **retention time** of Cu^{2+} on the surface

Conventional coating: Copper disappears as soon as it reaches the surface

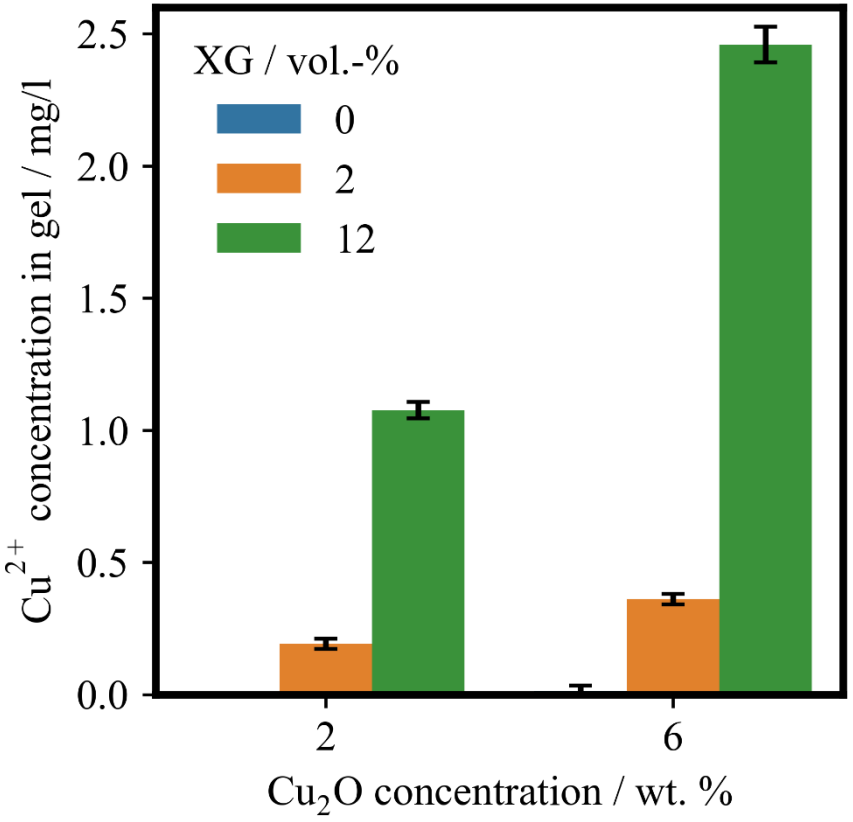


Hydrogel coating: Copper gets trapped in the gel layer → longer active time



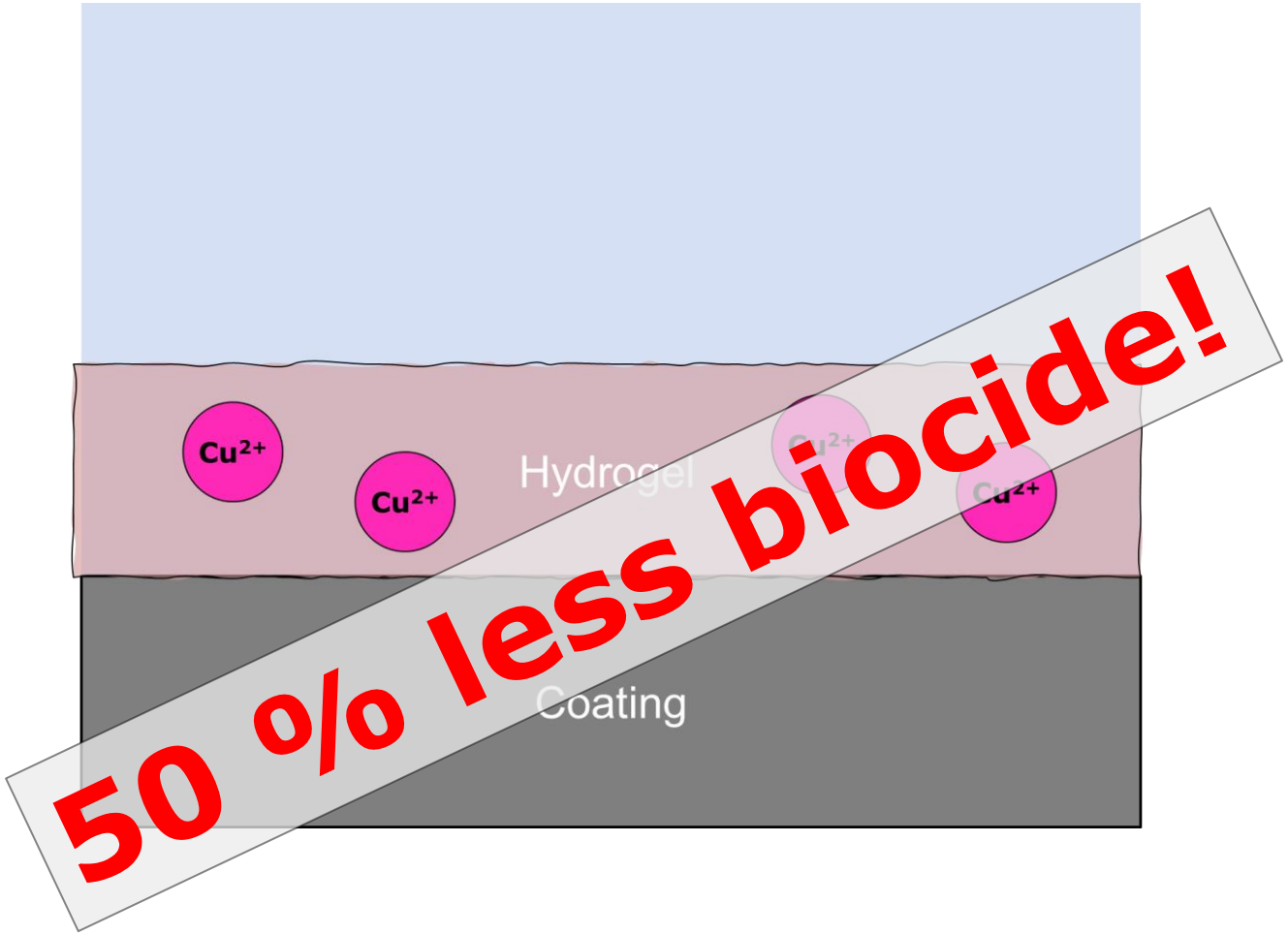
Cu^{2+} concentrations in the hydrogel are:

200 – 400 times higher
as the acute toxicity
values that the US environmental protection agency states for copper against water organisms



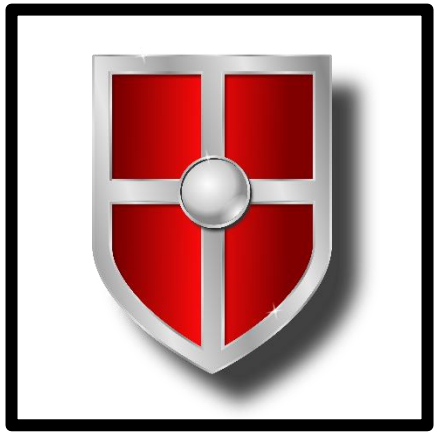
J. Sandberg, I. Odenvall Wallinder, C. Leygraf, M. Virta, Release and chemical speciation of copper from anti-fouling paints with different active copper compounds in artificial seawater, Materials and Corrosion. 58 (2007) 165–172. https://doi.org/10.1002/MACO.200604002.

Conclusion



Conclusion

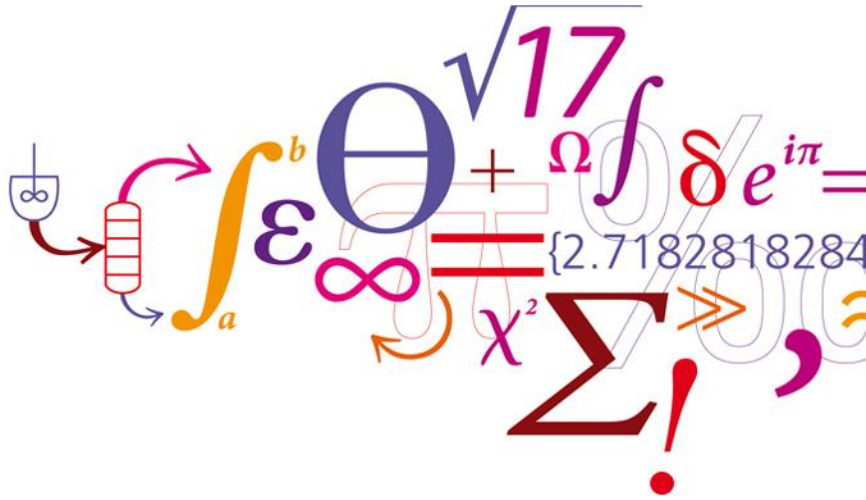
EASY



Acknowledgement

Financial support from the Hempel Foundation to CoaST (The Hempel Foundation Coatings Science and Technology Centre).

And Shawn Lindner for his dedicated work in the lab!



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