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Membrane filtration for the recovery of lipids from microalgae extracts

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MEMBRANE FILTRATION FOR THE RECOVERY OF LIPIDS FROM MICROALGAE EXTRACTS

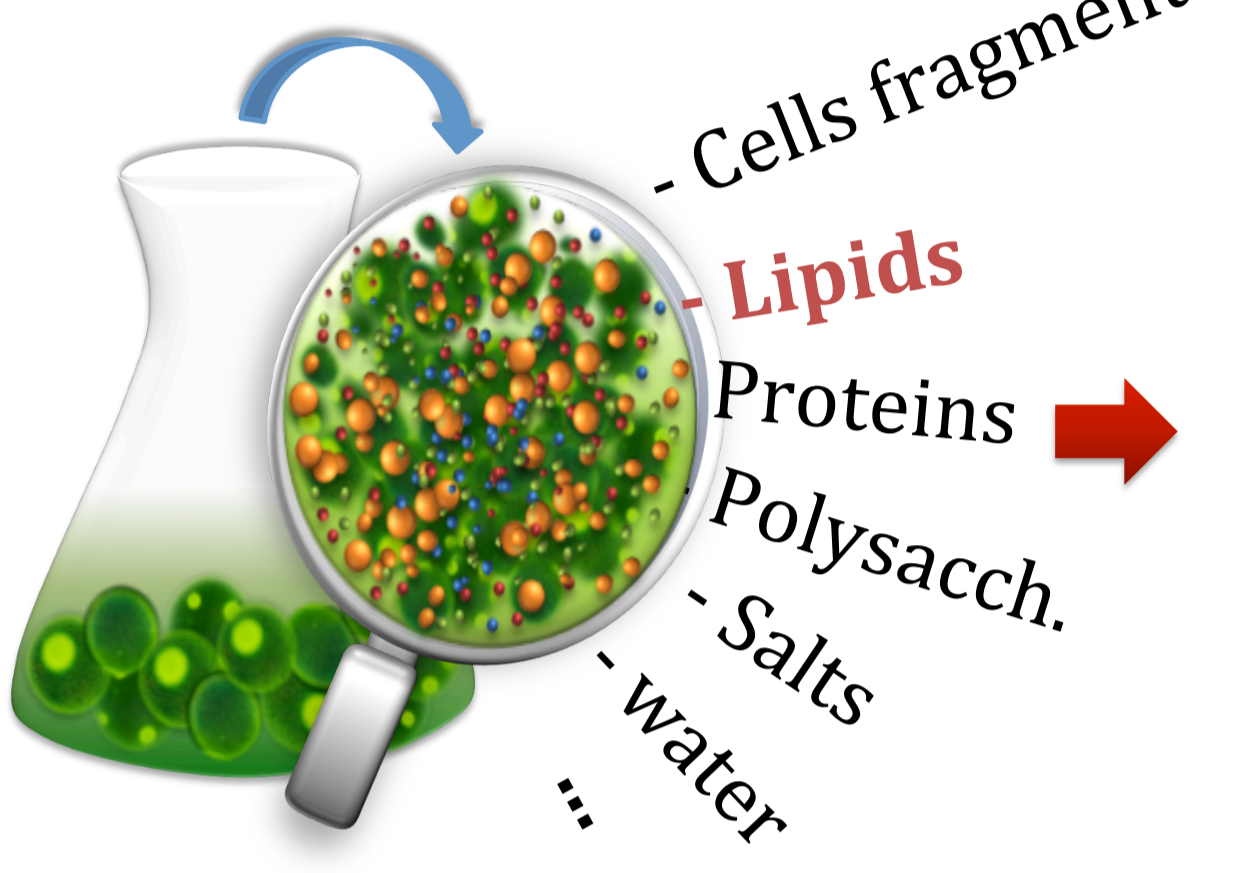


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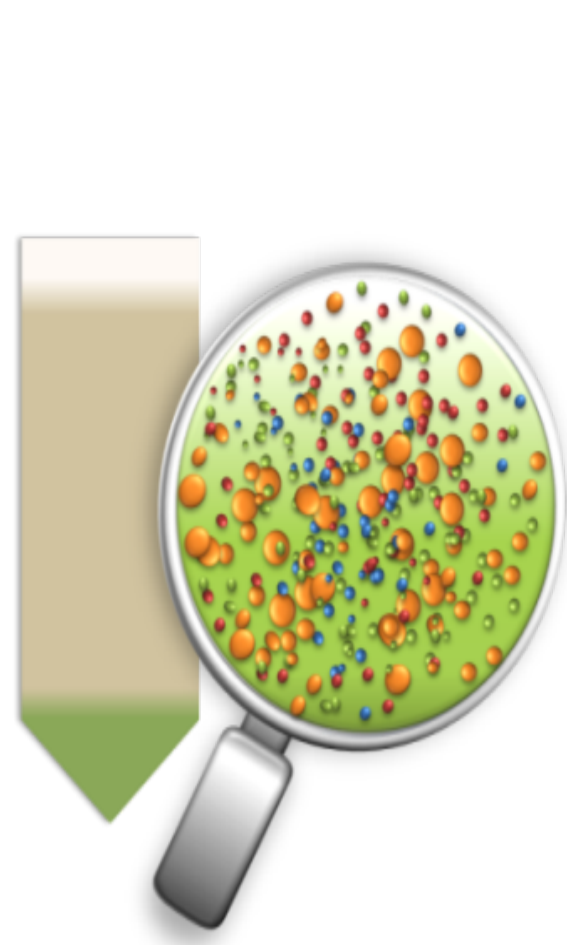
CNRS, GEPEA UMR-CNRS 6144, bd de l'Université, CRTT-BP 406, 44602 Saint-Nazaire CEDEX – France; <https://www.gepea.fr/>
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Introduction

Disrupted cells suspension

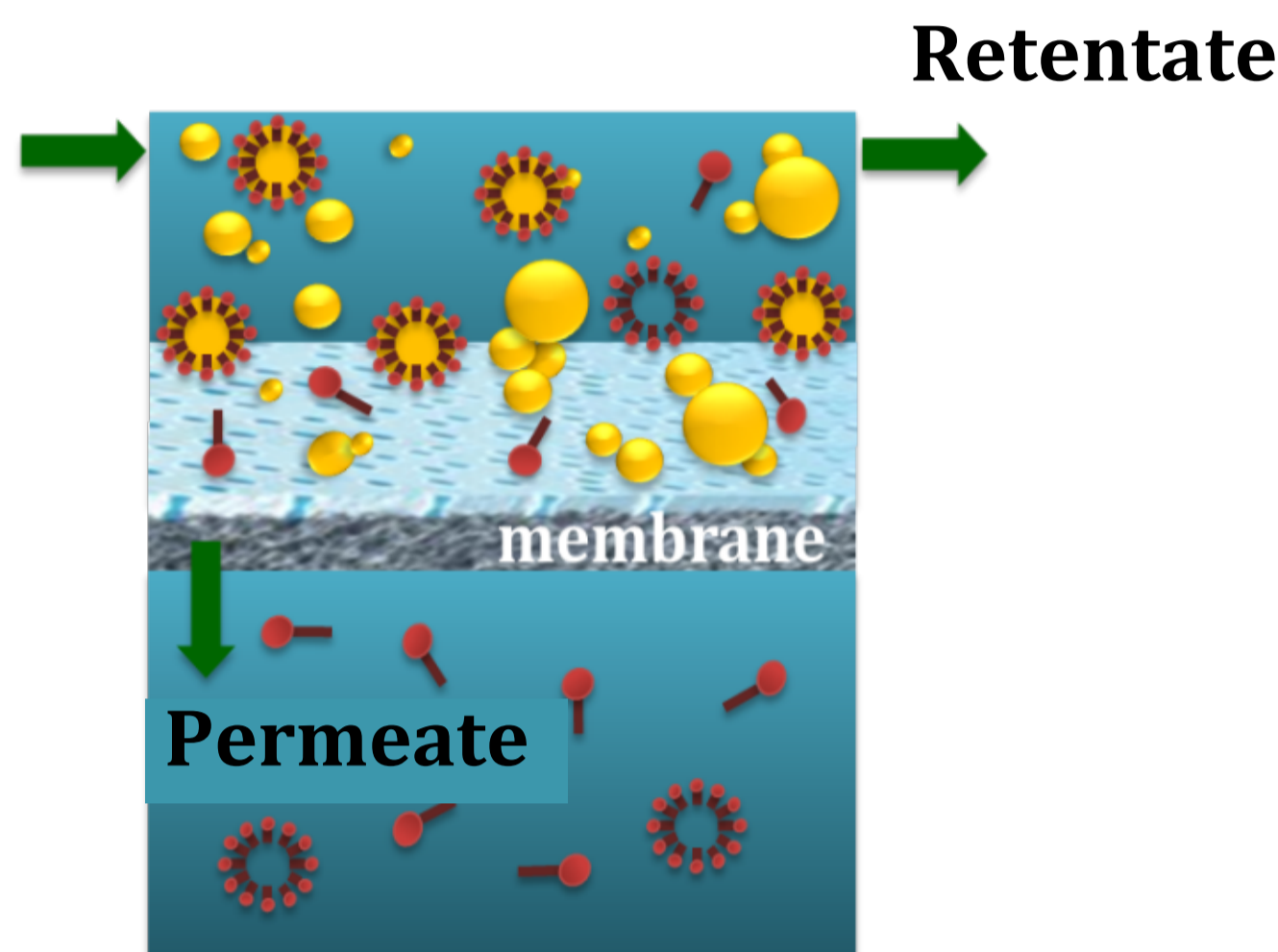


Clarification



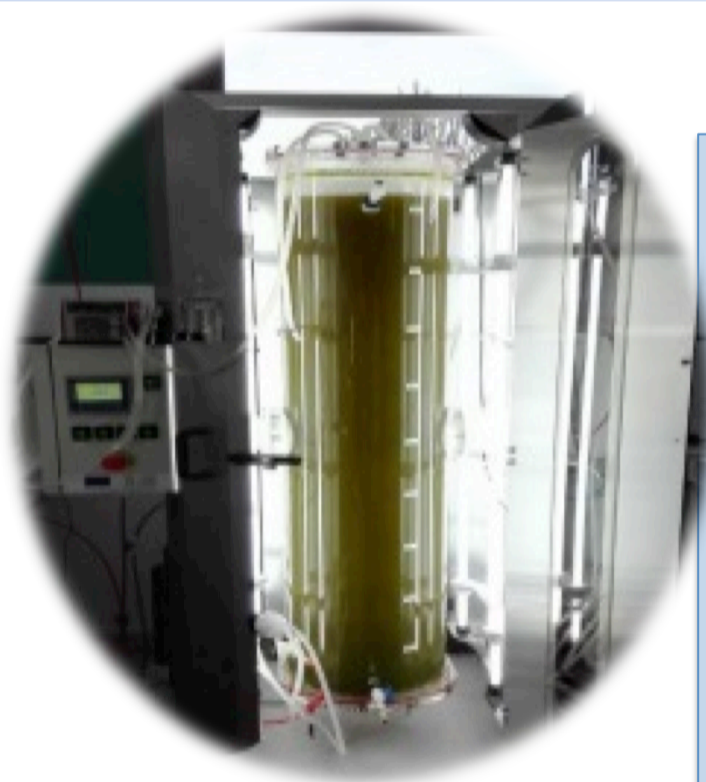
Feed

Ultrafiltration



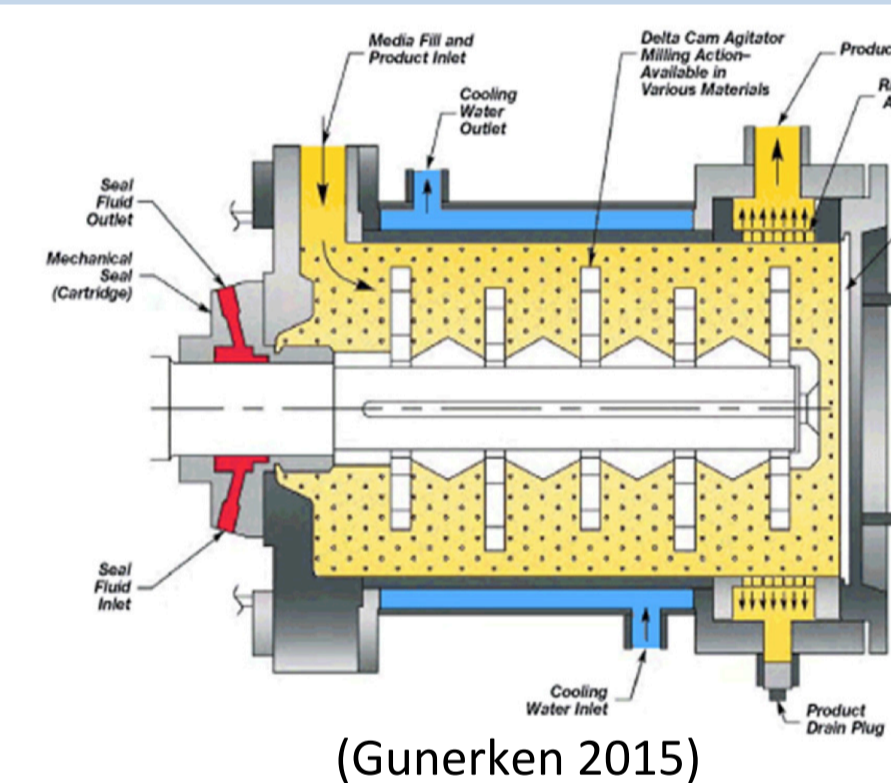
In this work we focus on the recovery of lipids from aqueous extracts of microalgae. After the culture of *Parachlorella Kessleri*, in starving conditions to enhance their lipid production, the micro-organisms were ground and the resulting mixture were centrifuged to extract aqueous fractions containing a large quantity of dispersed lipids.

Challenge



P-chlorella kessleri
Cultured
in starving conditions

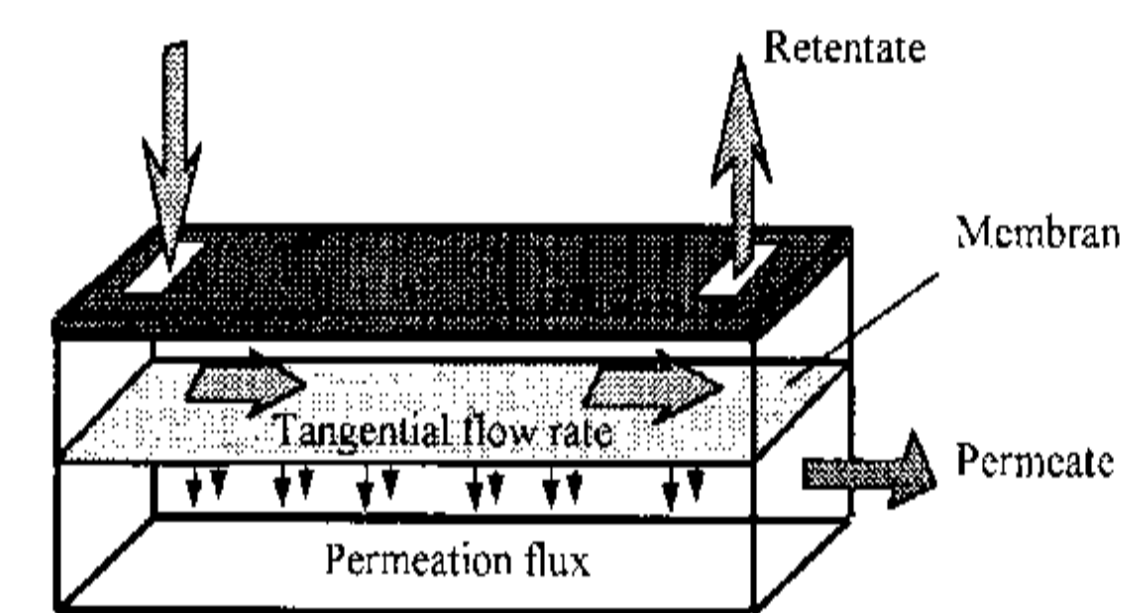
Cell disruption:
Target molecules are released
in the aqueous phase.
+ risk of degradation of their properties
+ risk of reorganisation: how to
fractionate?



(Guerken 2015)

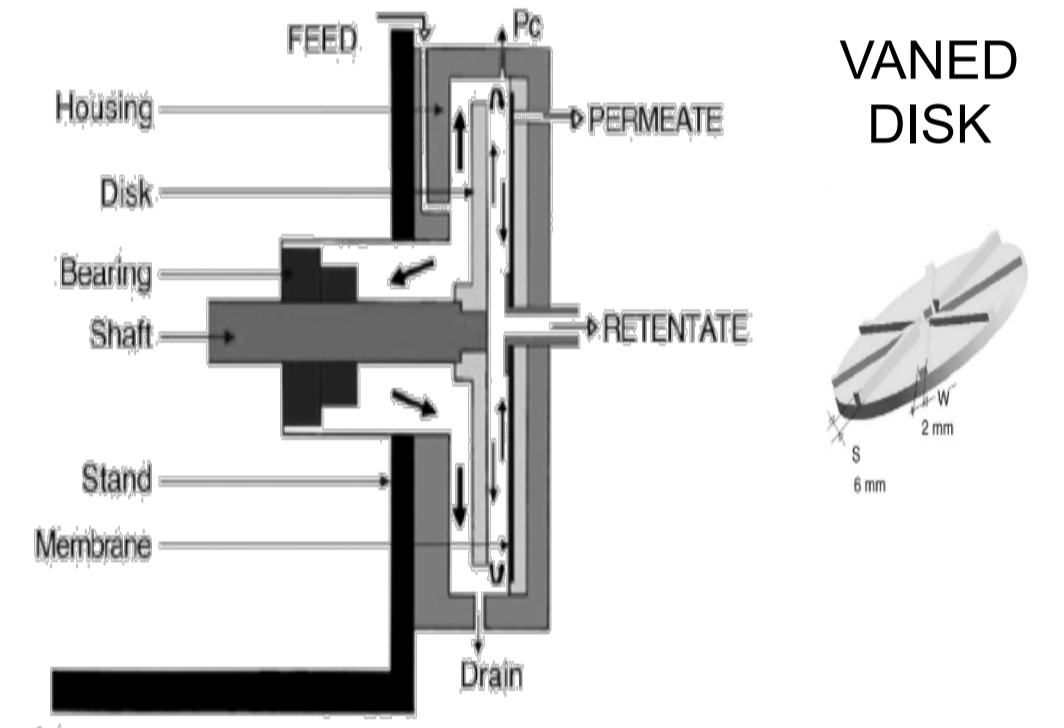
Ultrafiltration

Crossflow (CF) module
(Orelis Rayflow Pleiade)



Shear rate :
10,000 – 50,000 (s⁻¹)

Dynamic filtration (DF) module
(UTC Rotating disk)



Shear rate:
10,000 – 500,000 (s⁻¹)

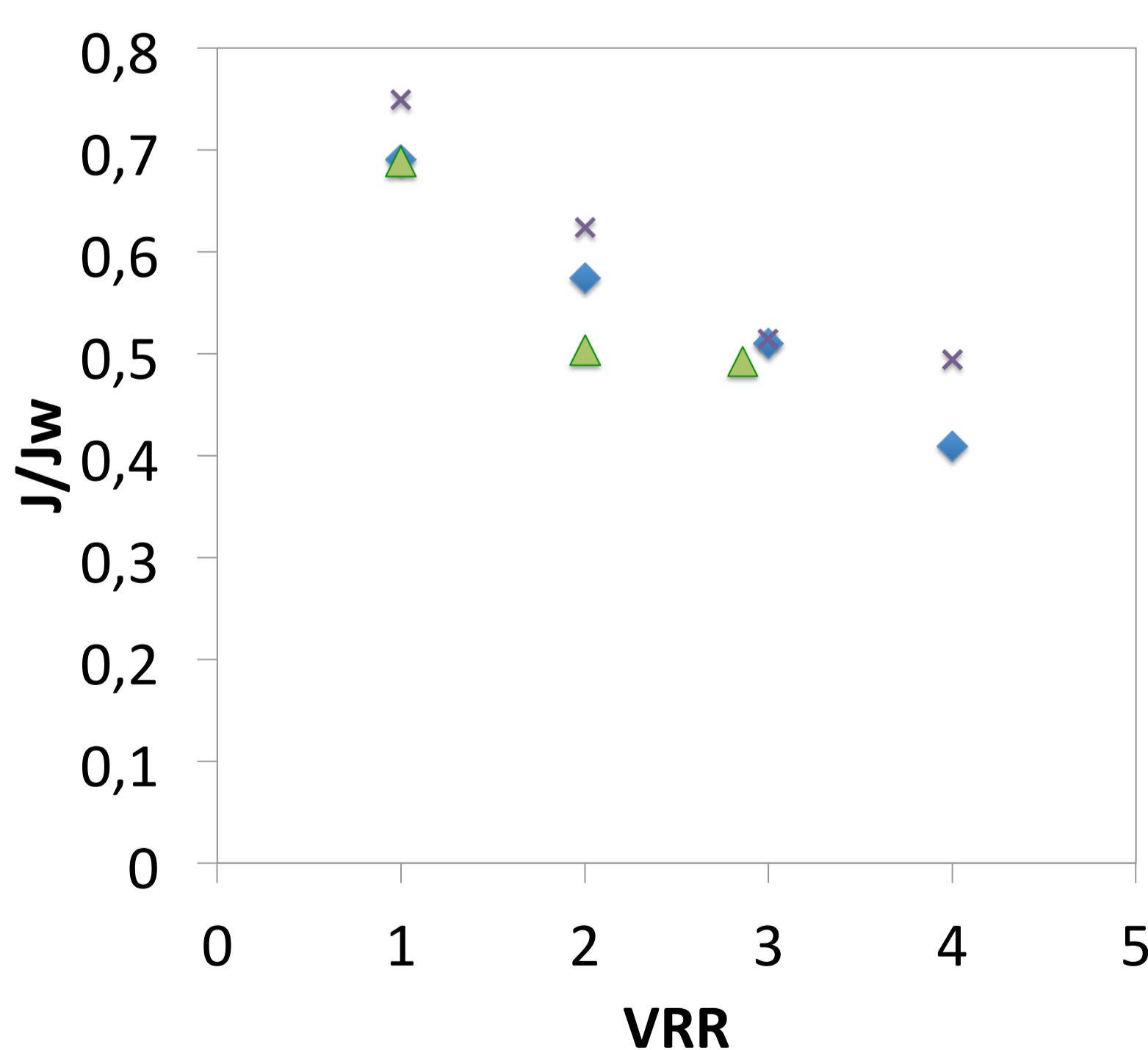
Real supernatant,
MS 2g/L

Model supernatant,
MS 20g/L

Model mixture: available in large quantities; controlled composition and organisation; Tests at high concentration

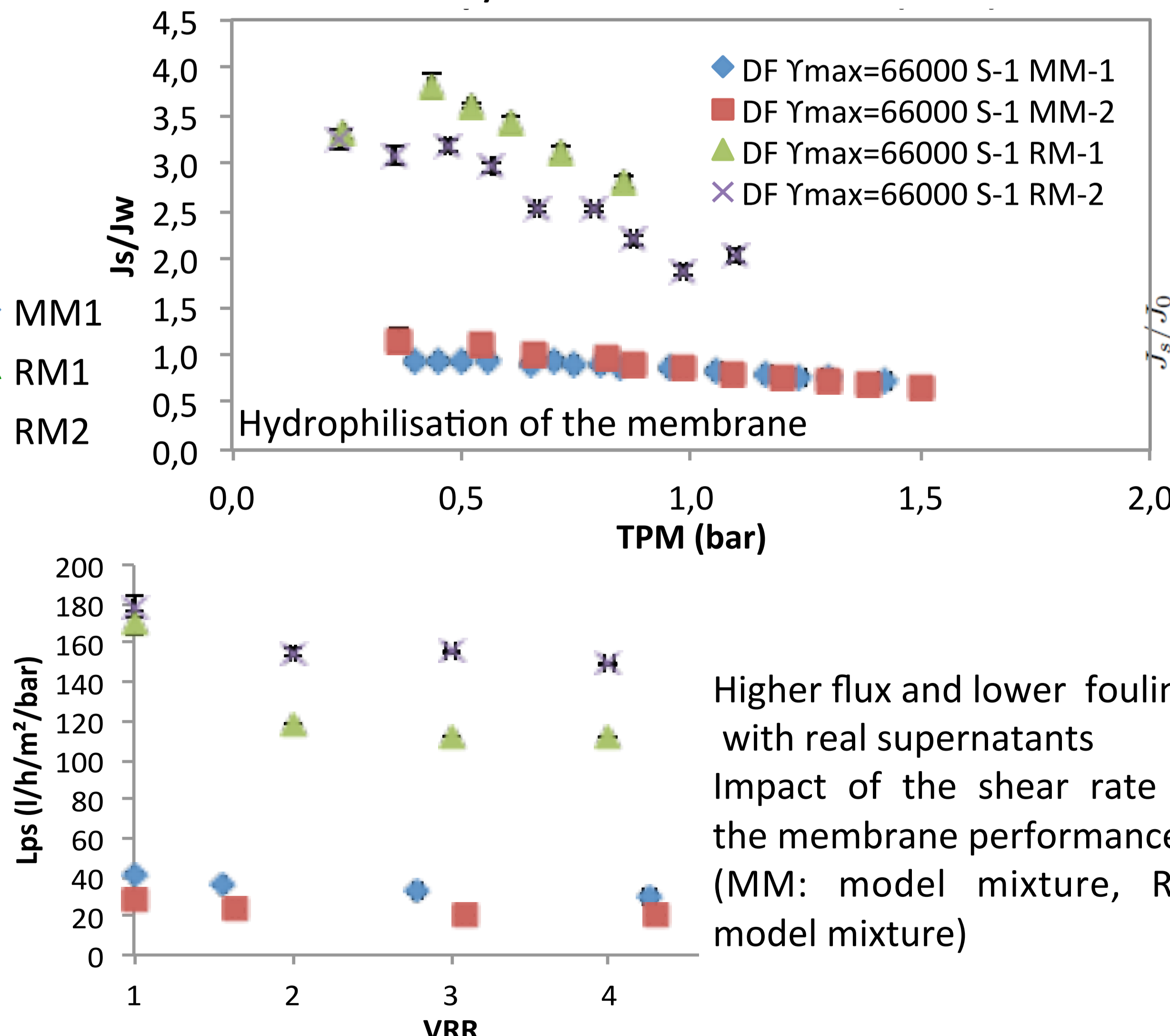
Filtration results

Cross flow filtration



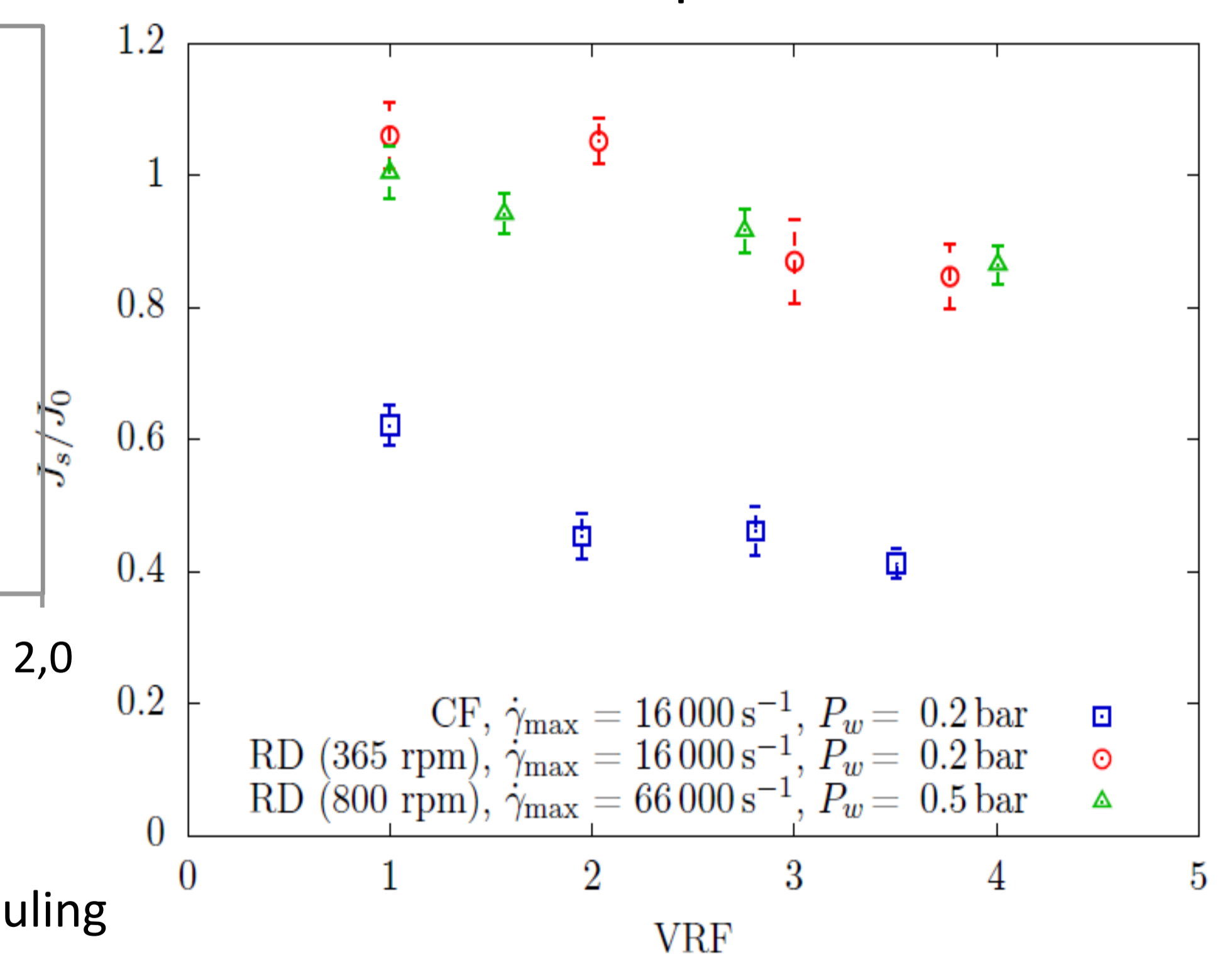
Similar flux and fouling
with model and real supernatants
Despite the concentration difference
(MM: model mixture, RM: model mixture)

Dynamic filtration



Higher flux and lower fouling
with real supernatants
Impact of the shear rate on
the membrane performances
(MM: model mixture, RM:
model mixture)

Comparison



Higher flux of dynamic filtration compared to
cross flow filtration using the model mixture

Conclusions and Perspectives

The membrane filtration allows the concentration of lipids from the aqueous extracts. The dynamic filtration offers interesting flux. The model mixtures allows the prediction of the fouling with concentrated extracts. The retention of the other compounds will depend on the cell disruption conditions: this will be deepened in a future study (PhD Shuli LIU). The membrane modification through hydrophilisation or fouling will be characterised through innovative technics in a future work (post-doctoral study, collaboration with ISCR Rennes and INRA Nantes).