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## Characterisation of the fouling of an ultrafiltration polyethersulfone membrane fouled by an emulsion modelling lipids issued from Microalgae

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# Characterisation of the fouling of an ultrafiltration polyethersulfone membrane fouled by an emulsion modelling lipids issued from Microalgae

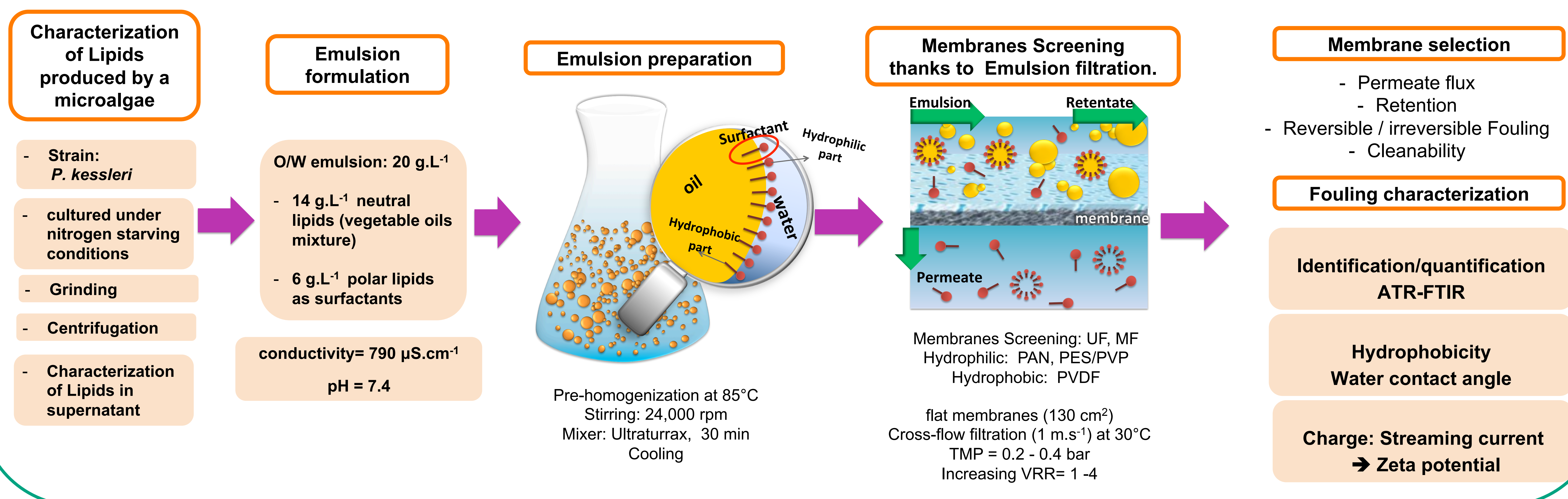
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## Context / Objectives

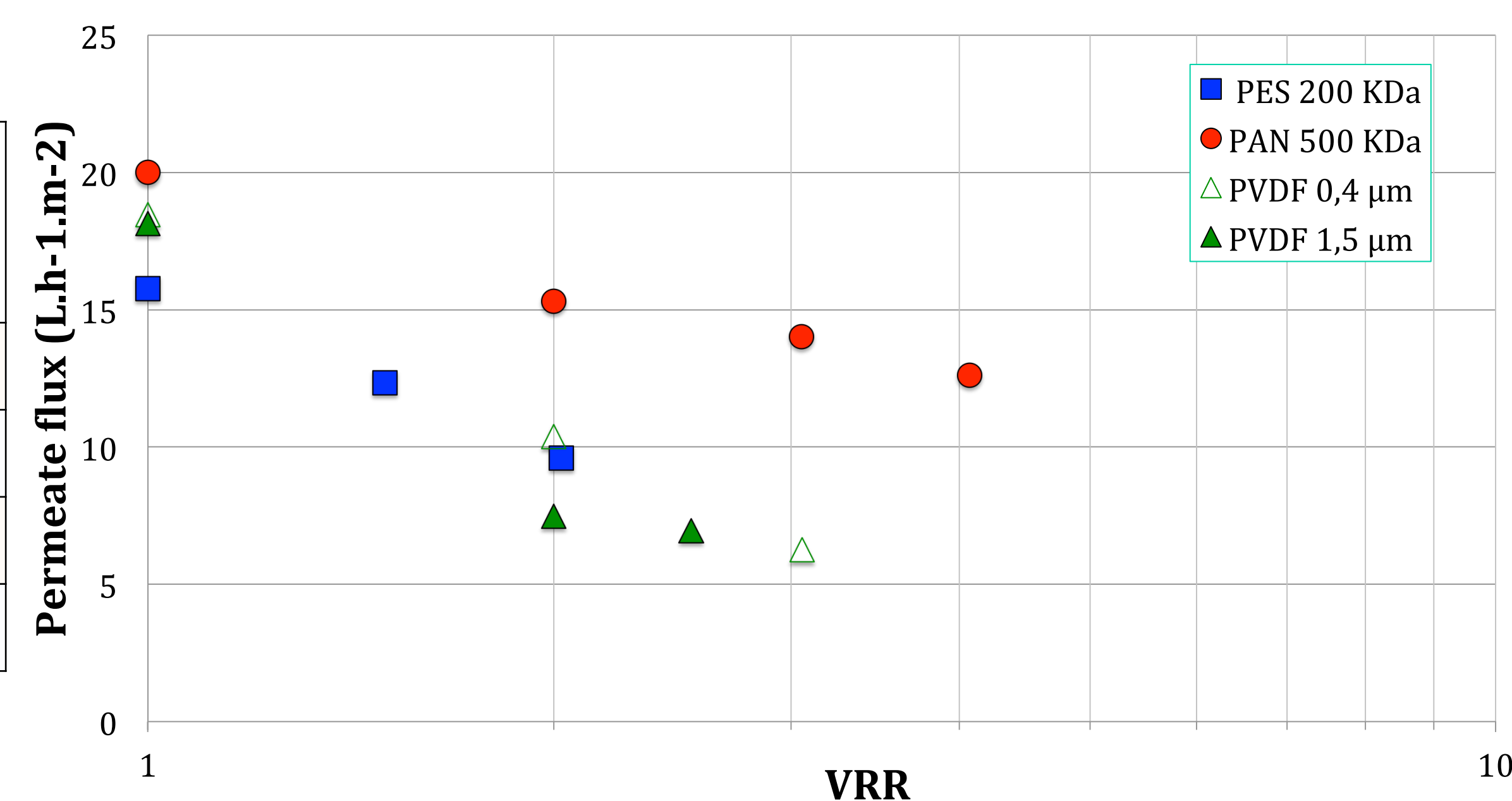
- Microalgae can transform CO<sub>2</sub> in biomass and in high value molecules such as **triglycerides**, proteins or polysaccharides.
- Membrane filtration is a promising process for Microalgae biorefinery : low energy consumption / integrity of all valuable compounds / valorization of all fractions.
- However integration of membranes is not trivial because of the complexity of feed solutions that may contain cell fragments, lipids, etc.
- This work aims at the integration of **ultrafiltration for the recovery of lipids**.
  - A **synthetic Oil /Water emulsion** was formulated based on the lipids profile of a microalgae cultured under nitrogen starving conditions
  - **Fouling** was characterized thanks to **permeate flux**, **ATR-FTIR** and **streaming current** measurements

## Modelling of Oil / Water emulsion and general approach



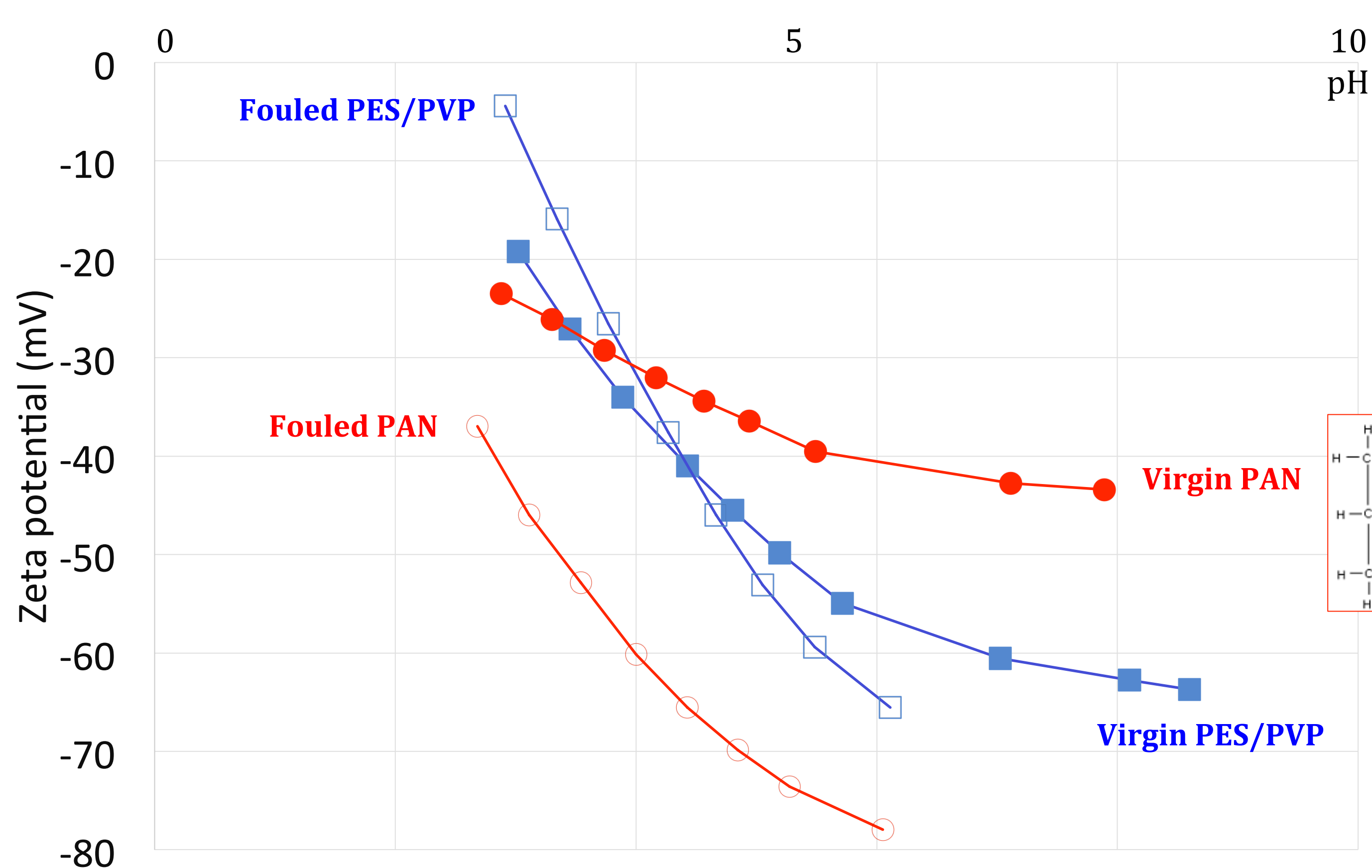
## UF /MF → PAN membrane: the best one

Membrane Polymer	MWCO / pore size	Critical TMP (bar)	Lp <sub>water</sub> L.h <sup>-1</sup> .m <sup>-2</sup> .bar <sup>-1</sup>	Lp <sub>emulsion</sub> L.h <sup>-1</sup> .m <sup>-2</sup> .bar <sup>-1</sup>	Lp <sub>emulsion</sub> / Lp <sub>eau</sub>	J <sub>cleaned membrane</sub> / J <sub>water</sub>	Lipid Retention
PAN	500 kg.mol <sup>-1</sup>	0.25-0.40	82 - 325	63 - 160	0.5 - 0.8	0.92	0.985
PES/PVP	200 kg.mol <sup>-1</sup>	0.26-1.00	20-152	15-85	0.5-0.8	0.81	0.987
PVDF	0.4 μm	0.20-0.25	50-250	50-110	0.4-0.9	0.98	0.946-0.985
PVDF	1.5 μm	0.25	51	27	0.5	0.86	0.966-0.981

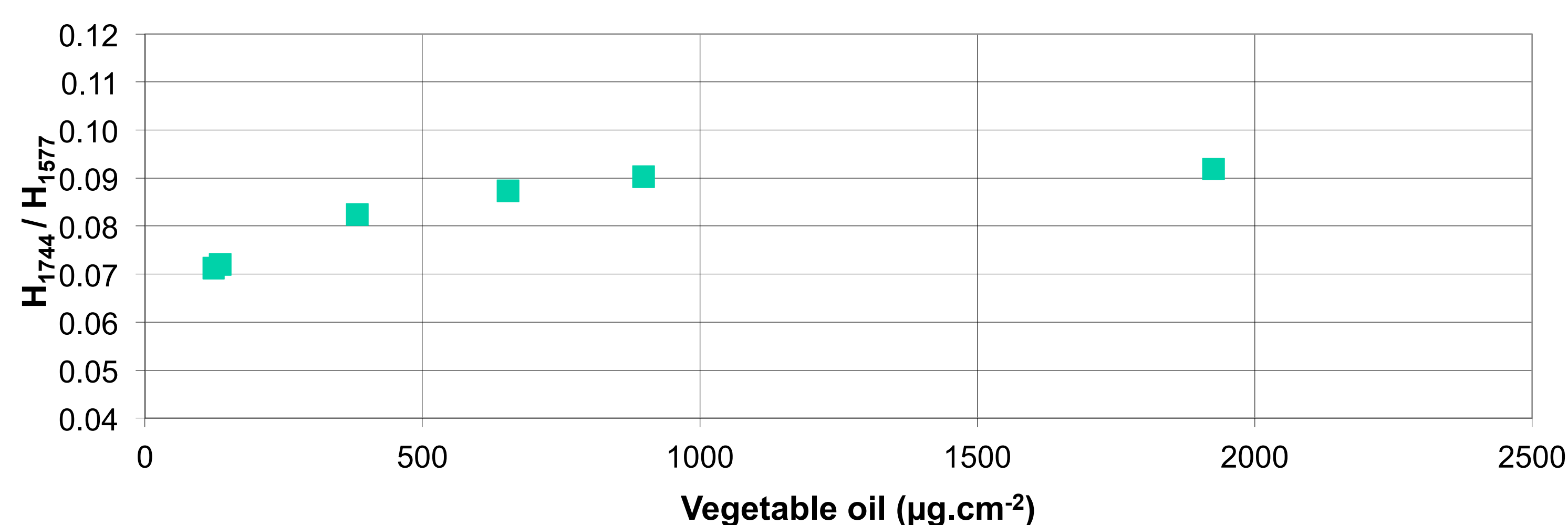
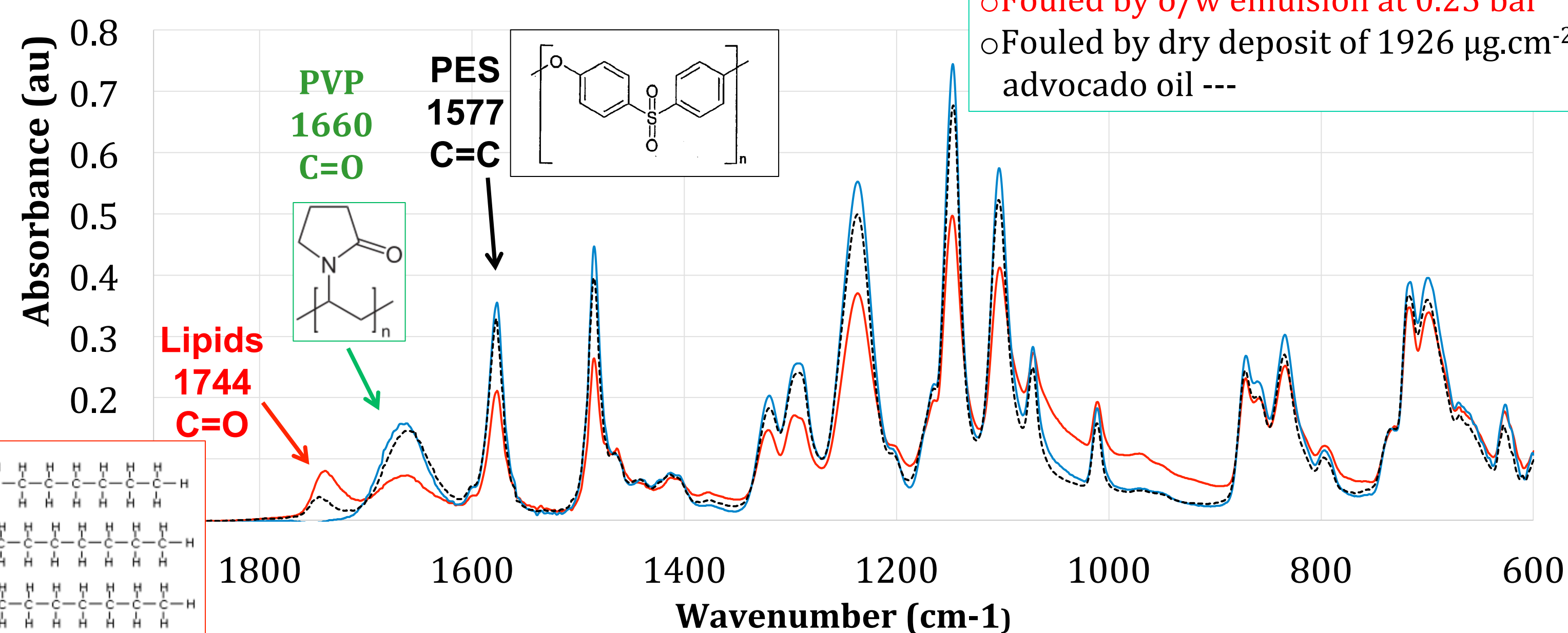


## UF virgin / fouled membranes:

### Zeta potential



### ATR-FTIR



- The PES/PVP membrane isoelectric point increased after fouling
- The PAN membrane charge was more negative after fouling
- Fouling had more impact on the PAN membrane surface charge than on PES/PVP membrane

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