Assessment of (bio)fouling potential and cleanability of various materials

(Bio)fouling in RO/NF systems
Cost savings and reduced environmental impact:
- Membrane fouling is a major issue in water production
- Study/understand the effect of different membrane anti-fouling coatings in the early physicochemical phenomena of membrane biofouling
  - relative rates of adsorption
  - adsorption constants
  - desorption rates

Q-sense = QCM-D
- Quartz crystal microbalance with dissipation monitoring
- 4 parallel studies: 4 channels, 200 μL volume chamber, 15-65°C, 0.005 s resolution, 12 harmonics, 150 μL/min
- In-situ quantification mass, attachment, detachment, reaction, degradation, cross-linking, swelling, collapse, conformation changes in same device

Approach: apply 0.2 μm layer of polyamide RO layer on QCM-D sensor, grow biofilm and cleaning efficiency test

In collaboration with Professor Taisara Nunes research group, we were able to coat the Au surface of the QCM-D sensors with a functional thin film polyamide, the same used in RO membranes.

Chemical functionalization of the polyamide layer in the QCM sensor:
Hydrophobic groups increase hydrophilicity, and the opposite the introduction of ionic charges produces a hydrophobic surface. The modifications will be fully characterized.

Figure 1. Methodology for sensor coating (i) polyamide, (ii) hydrophobic, (iii) constant attachment of a radicant.

Future work: promising materials will be selected for testing at bench-scale or a larger scale.

Conclusions
- Approach for membrane (bio)fouling control to test and evaluate - novel membranes
- cleaning chemicals and strategies
- The approach is fast, reliable, and accurate

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