Limited swelling of deposit (gel) layer obtained in crossflow filtration of casein micelles dispersion

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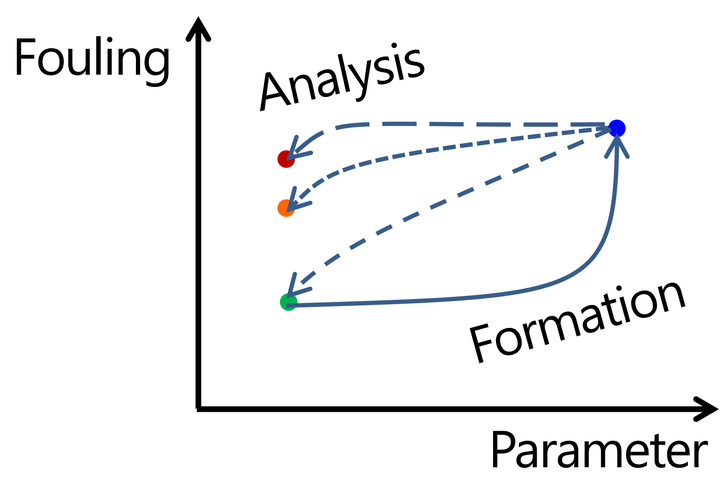
THIS POSTER SERVES TO UNDERLINE THE FOLLOWING:

- characterization of membrane fouling is essential for understanding of filtration mechanism;
- membrane fouling is sensitive to all operating conditions, including that applied during the fouling formation (filtration), fouling removal (rinsing), and fouling analysis;
- as well as the fouling formation, the fouling removal is not immediate; this must be accounted during the fouling analysis;
- all experiment conditions should be described properly (e.g. no such thing as "simple rinsing")



- evolution of fouling during the fouling analysis can reveal interactions in the fouling layer.

These statements originate from our work on the fouling (gel layer) analysis in the ultrafiltration of soft colloidal particles (casein micelles dispersions).

Our results were presented in next articles:

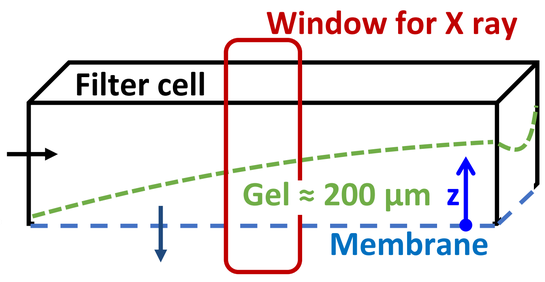
[1] Loginov et al. J. Membr. Sci. 595 (2020) 117498

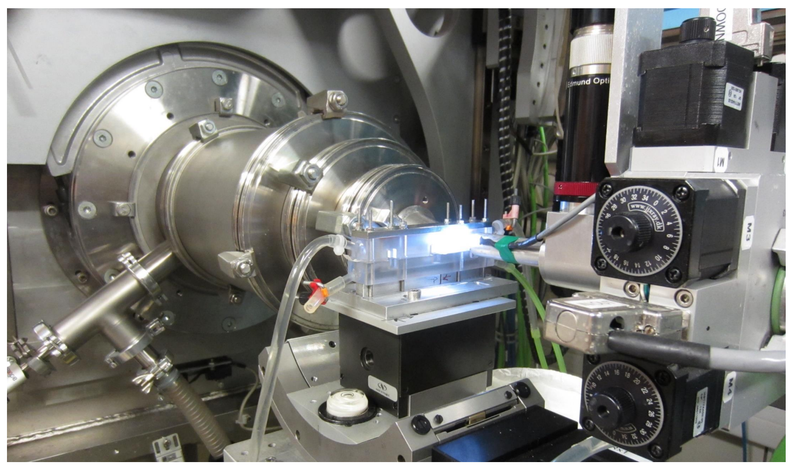
[2] Doudiès et al. J. Membr. Sci. 618 (2021) 118700

[3] Loginov et al. J. Membr. Sci. 630 (2020) 119289

SOME ILLUSTRATIONS OF OUR WORK ON FOULING ANALYSIS

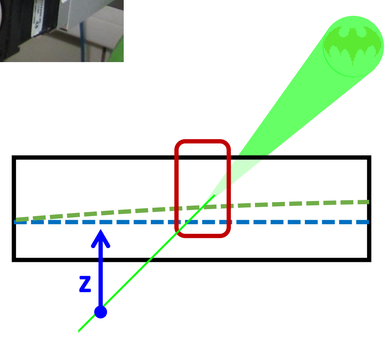
- Suspension is filtered and gel layer is obtained under controlled crossflow and transmembrane pressure.

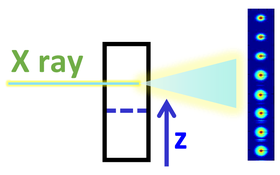




Actual photo of experiment (filter cell and SAXS chamber).

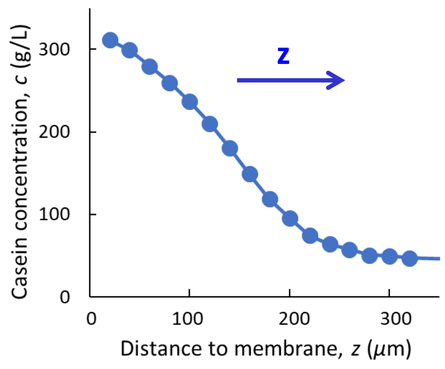
- Concentration polarization and gel layers are "scanned" through the window by narrow X-ray beam, and scattering patterns are registered.



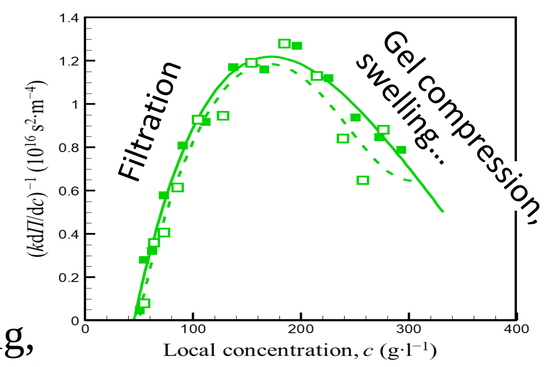


Side view of the filter cell and scattering patterns (SAXS patterns) obtained for different distances from the membrane surface.

- Patterns are analyzed and local casein concentrations are obtained for different distances from the membrane surface *z*; i.e. gel concentration profile is obtained: each distance z → one SAXS pattern → → one local gel concentration.



- Concentration profile is recalculated into the local compressibility-permeability function (here $k d\Pi/dc$) that is an integral characteristic of a filtered material (here casein micelles); it describes filtration, compression, swelling, etc. It can be studied for different fouling conditions or different stages of experiment (e.g. formation *vs* fouling removal, gel compression *vs* gel swelling, etc.)



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EUROMEMBRANE
Copenhagen Denmark
12-16 September 2021