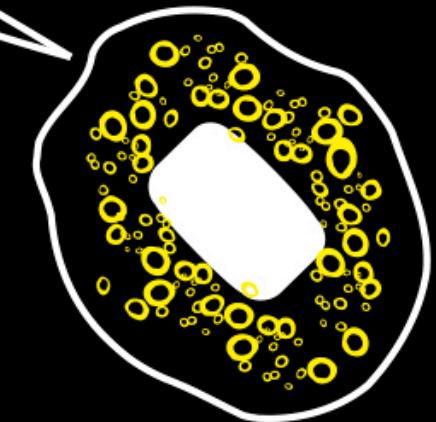


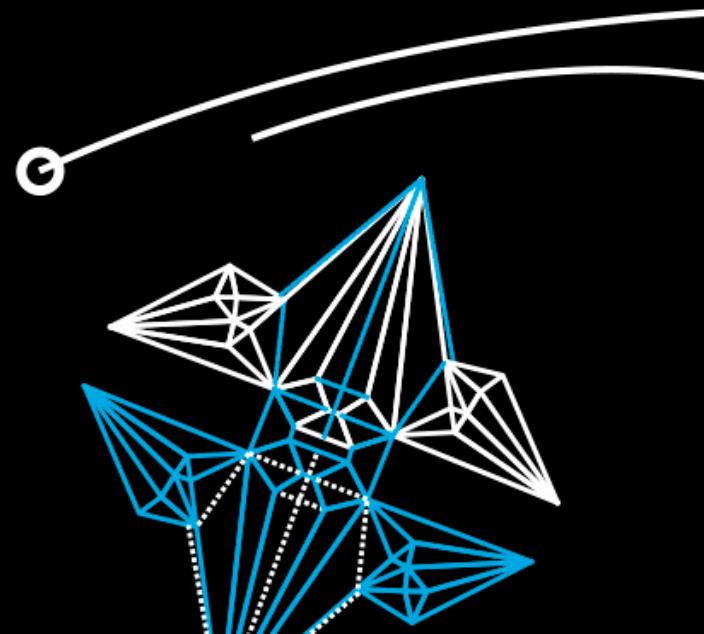
UNIVERSITY OF TWENTE.



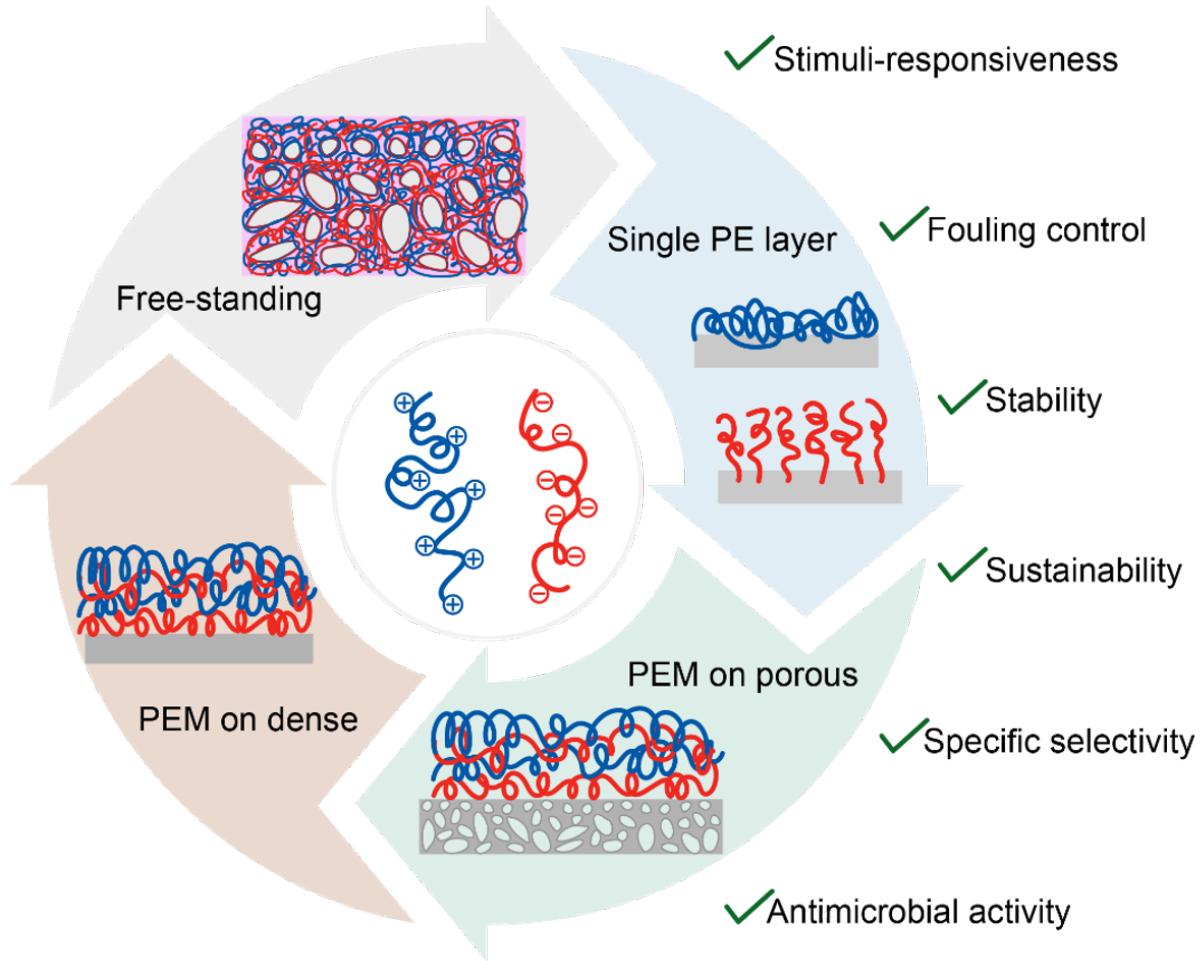
## ASYMMETRIC POLYELECTROLYTES MULTILAYERS AS HIGHLY TUNABLE NANOFILTRATION MEMBRANES

Esra te Brinke, Jurjen Regenspurg, Ettore Virga and Wiebe M. de Vos

Soft Matter & Self-Assembly, 19 January 2023

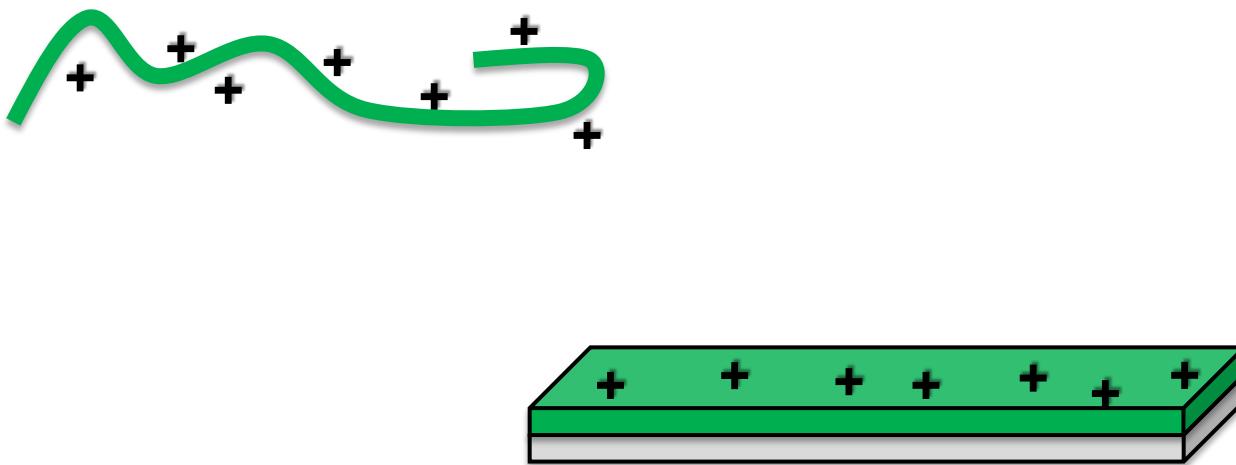


# ROLE OF POLYELECTROLYTES IN MEMBRANES FABRICATION



# Membrane Nanotechnology

---



UNIVERSITY OF TWENTE.

# Membrane Nanotechnology

---



UNIVERSITY OF TWENTE.

# POLYELECTROLYTE MULTILAYERS ON HOLLOW FIBER MEMBRANES

---

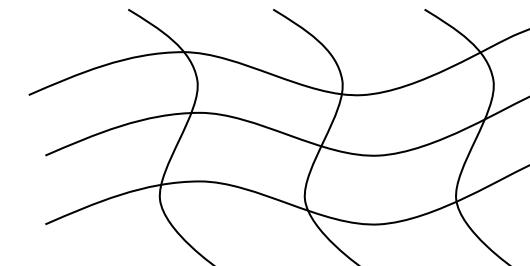
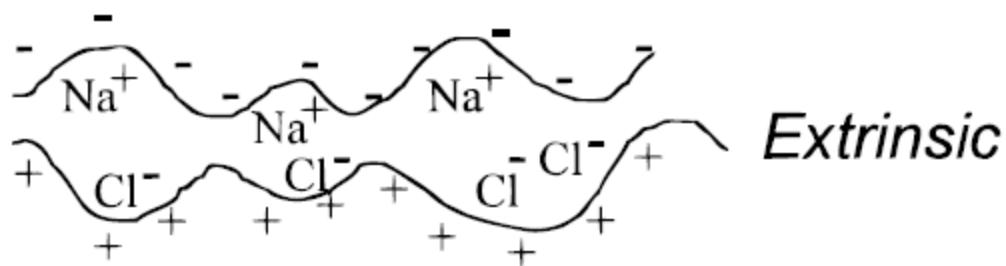
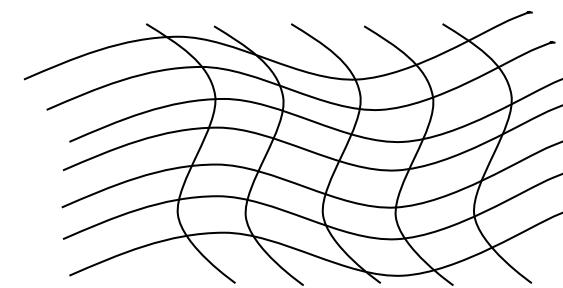
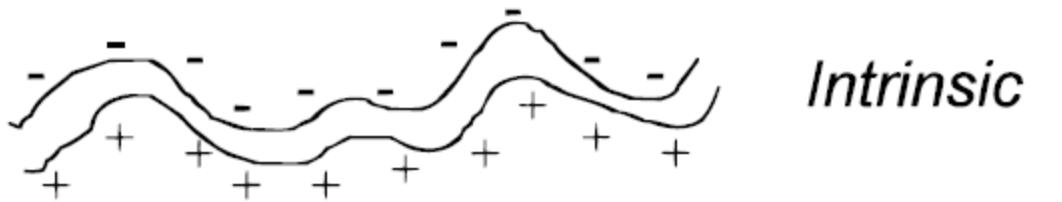
## Why Multilayers?

- Control
  - Choice of Polyelectrolytes
  - Salt concentration during coating
  - pH during coating
  - Number of Layers
- Very Thin (but stable) Layers
  - 10-100nm
- Easy incorporation of nanoparticles, proteins, vesicles etc
- Easy to prepare
  - Both on flat sheet as on hollow fiber geometry

# CONTROLLING PEM PROPERTIES

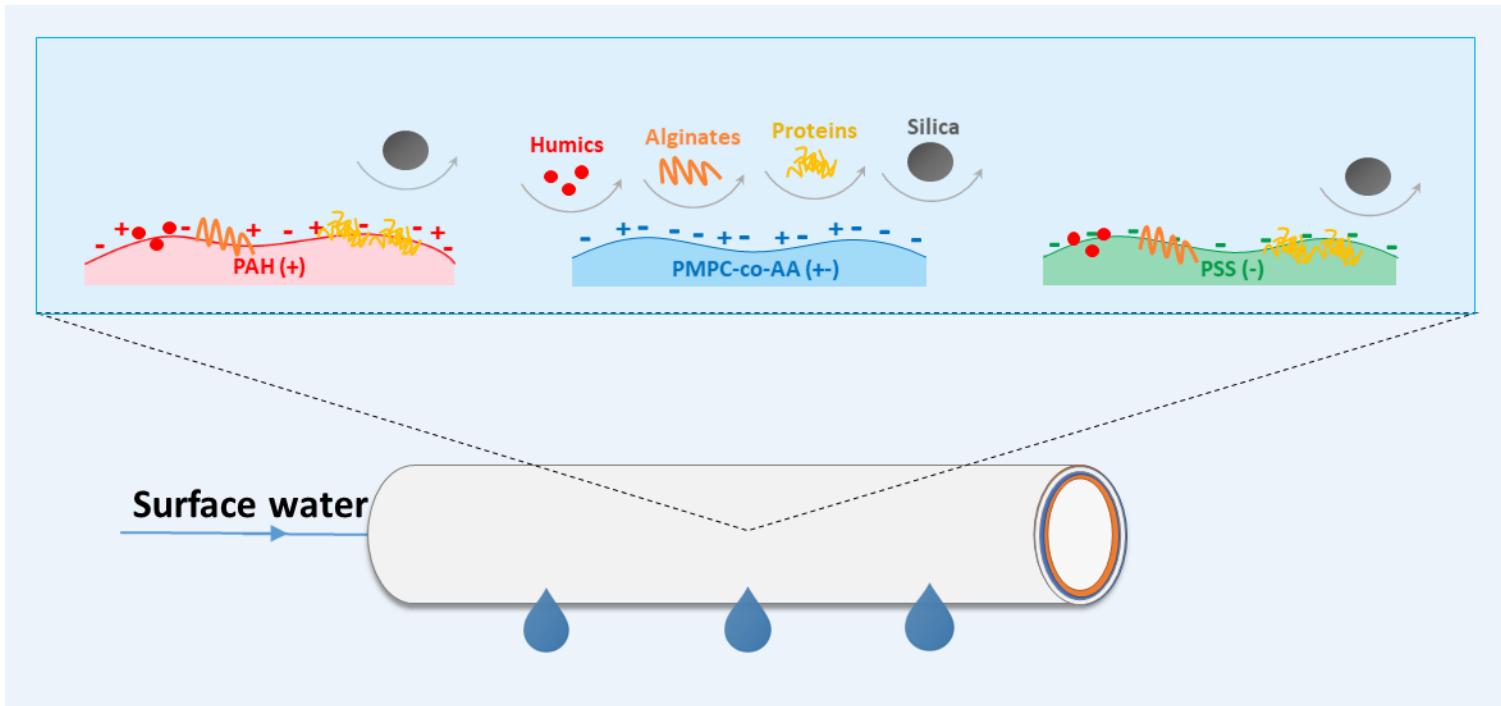
---

**Chart 1.** Intrinsic vs Extrinsic Charge Compensation



Schlenoff et al., JACS 1998

# POLYELECTROLYTE MULTILAYERS ON HOLLOW FIBER MEMBRANES



Fouling control  
through choice of  
the final layer

# MICROPOLLUTANTS

---

- Medicines
- Pesticides
- Plasticizers
- Hormones and hormone-disruptive compounds

# MICROPOLLUTANTS

- Medicines
- Pesticides
- Plasticizers
- Hormones and hormone-disruptive compounds

190 ton of medicinal waste found  
in the Dutch surface water!!!



▲ Foto ter illustratie. © Getty Images

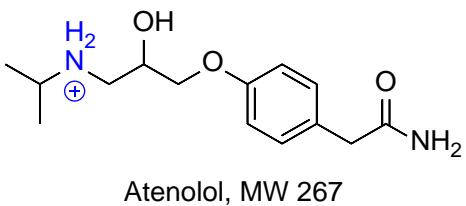
## '190 ton medicijnresten gevonden in Nederlands oppervlaktewater'

Een riskante hoeveelheid medicijnresten is de afgelopen jaren in het Nederlandse oppervlaktewater terechtgekomen. Het gaat om ongeveer 190 ton per jaar aan voorgeschreven medicijnen, zegt het Rijksinstituut voor Volksgezondheid en Milieu (RIVM) tegen [Trouw](#).

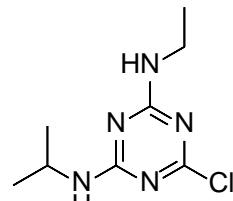
Binnenlandredactie 12-10-20, 08:07 Laatste update: 08:30

# MICROPOLLUTANT MIX

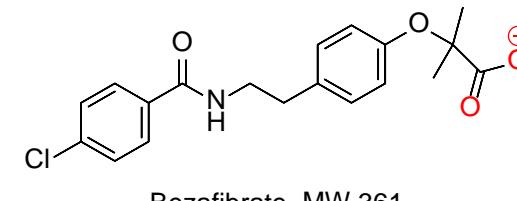
---



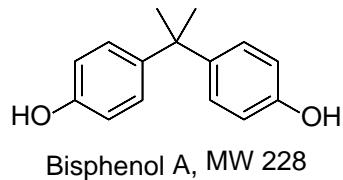
Atenolol, MW 267



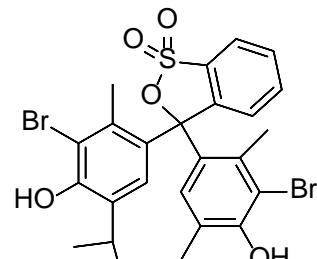
Atrazine, MW 216



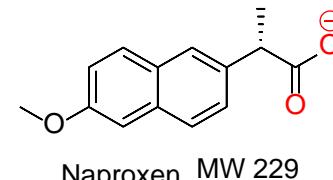
Beazfibrate, MW 361



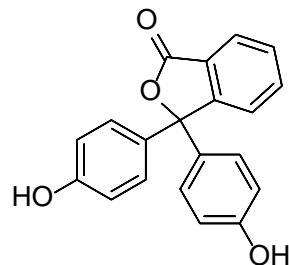
Bisphenol A, MW 228



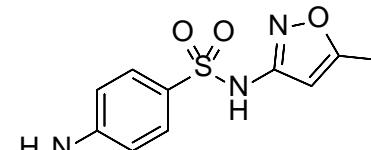
Bromothymol blue, MW 624



Naproxen, MW 229



Phenolphthalein, MW 318

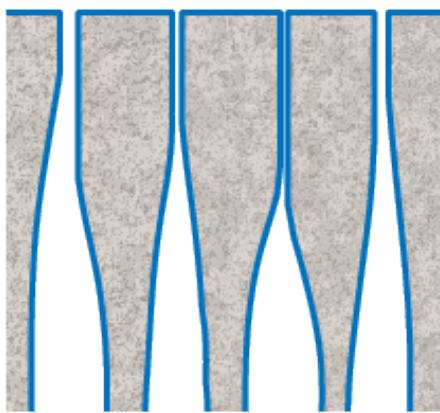


Sulfamethoxazole, MW 253

# ASYMMETRIC POLYELECTROLYTE MULTILAYERS

---

a.

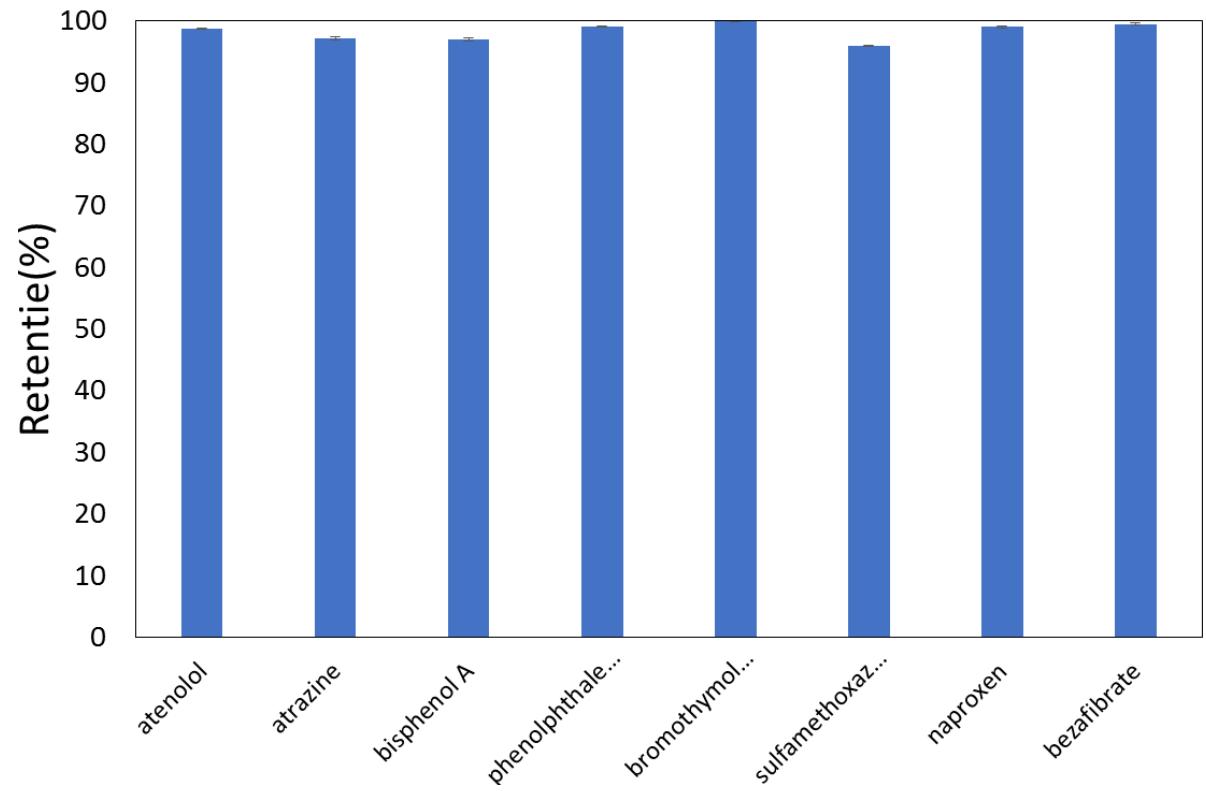
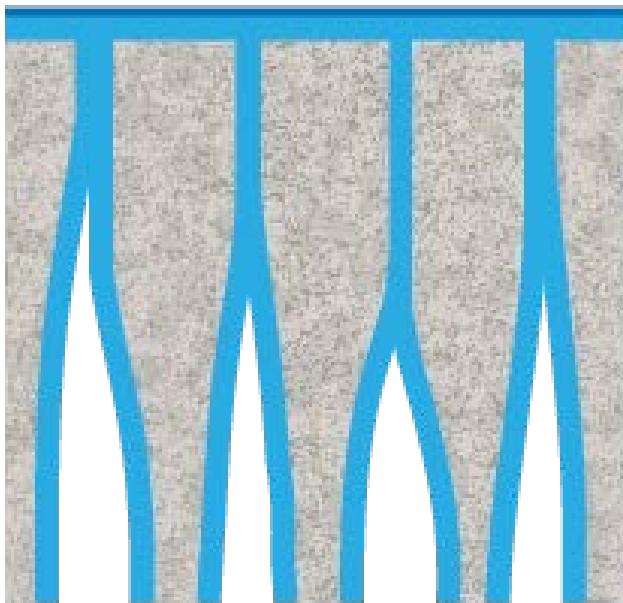


Thin dense layer: defects,  
low retention

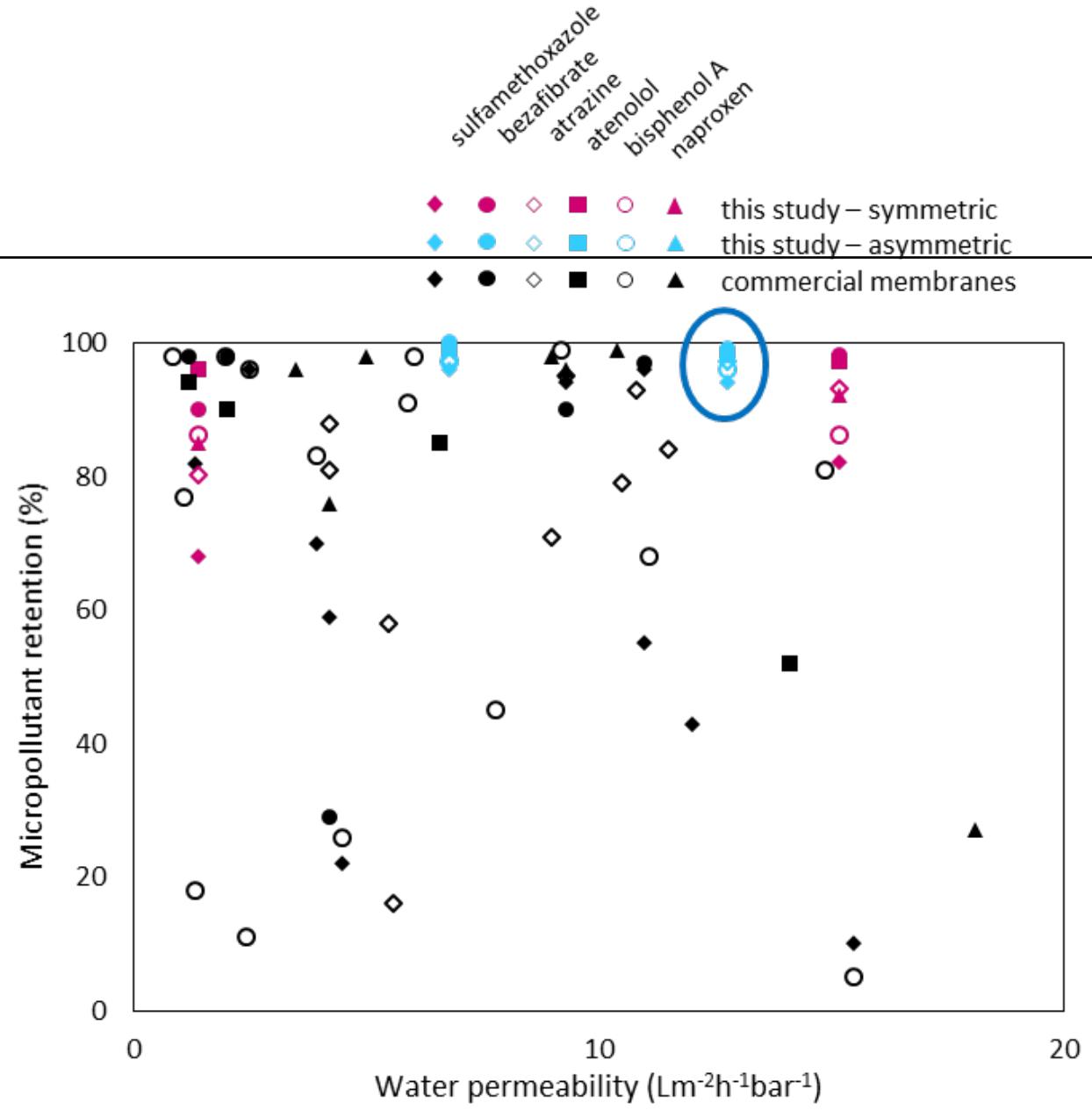
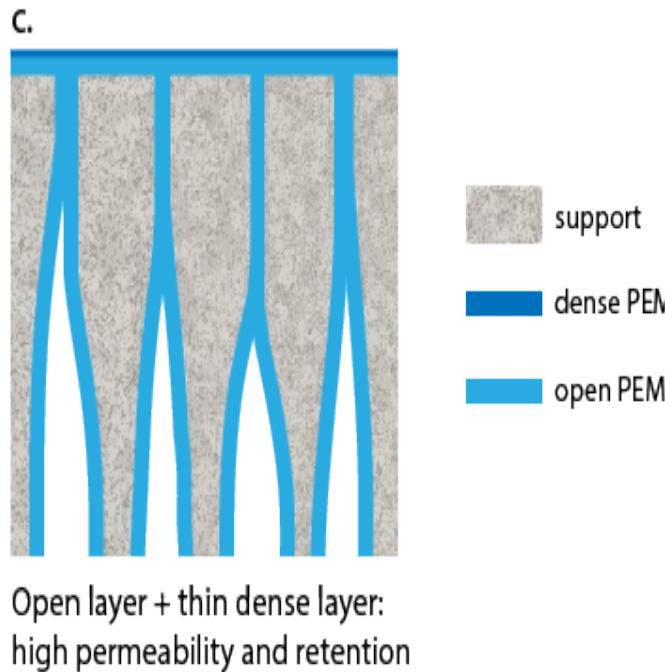
- support
- dense PEM
- open PEM

# REMOVAL OF MICRO-POLLUTANTS

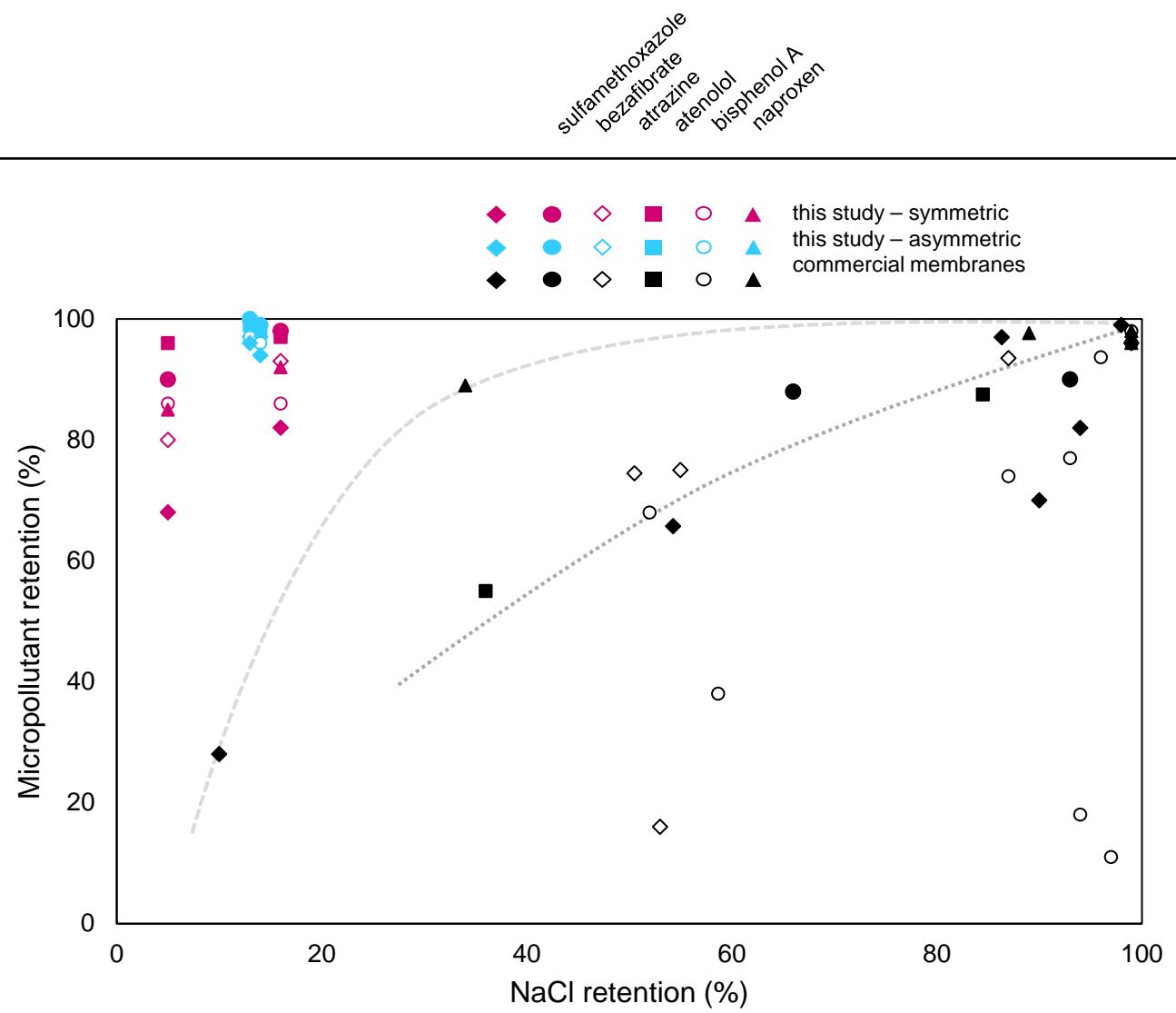
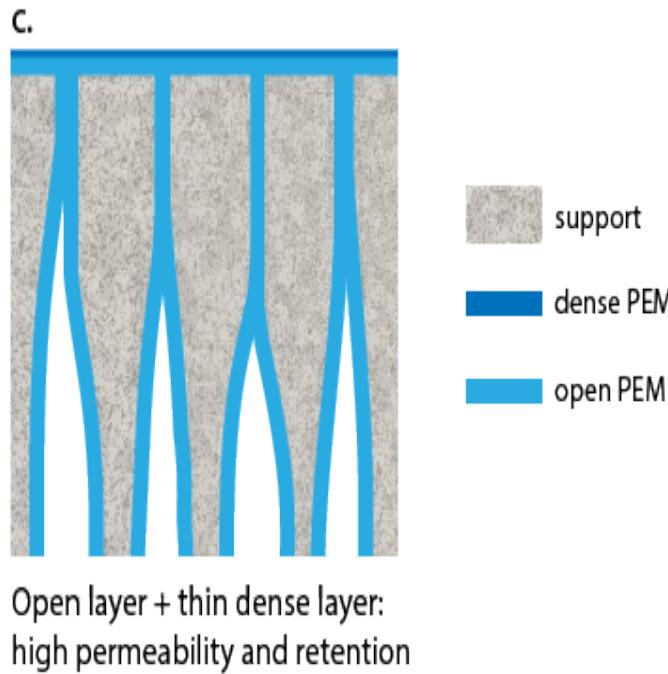
---



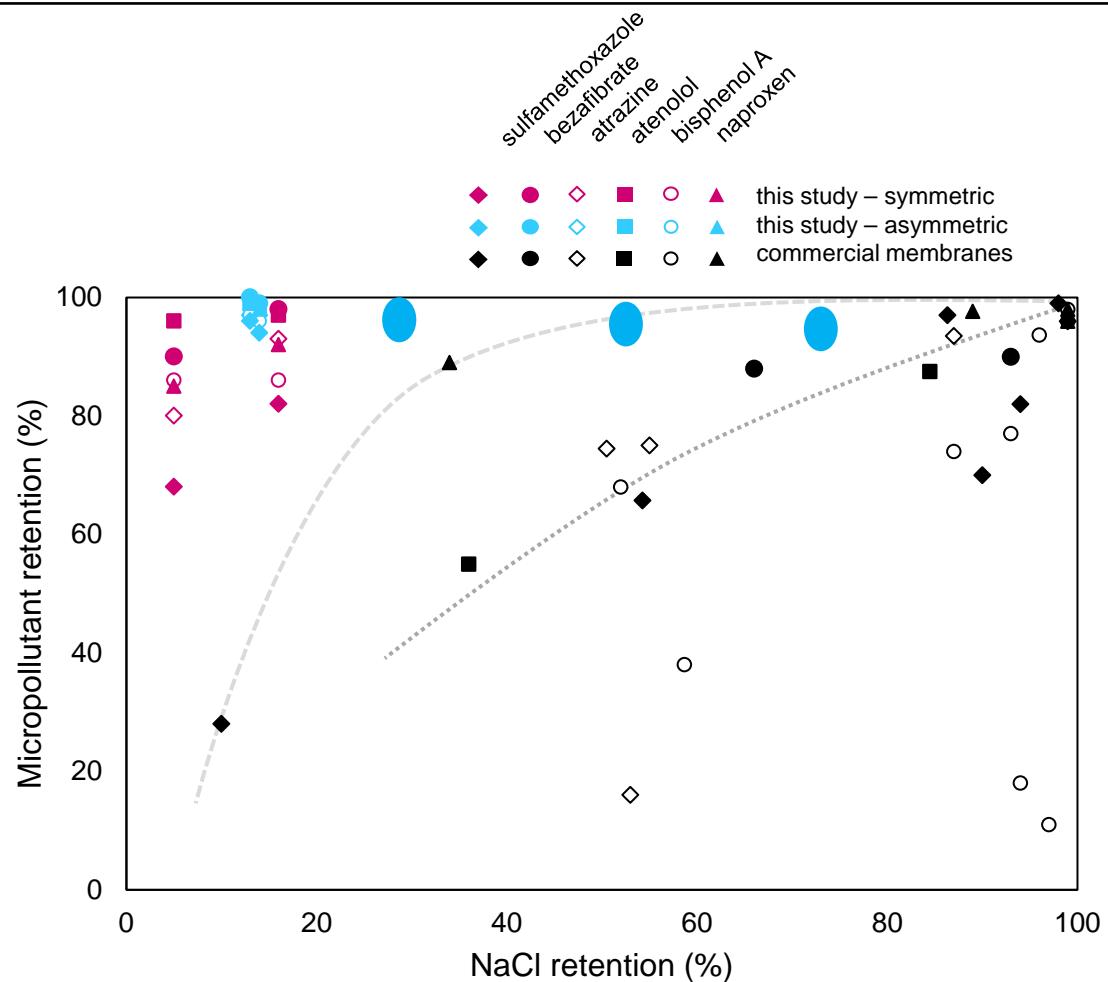
# LITERATURE STUDIES



# LITERATURE STUDIES



# VERSATILITY, LOW OR HIGH SALT RETENTION ON DEMAND



# A NEW PROCESS FOR WASTEWATER TREATMENT

---



Water  
Salts

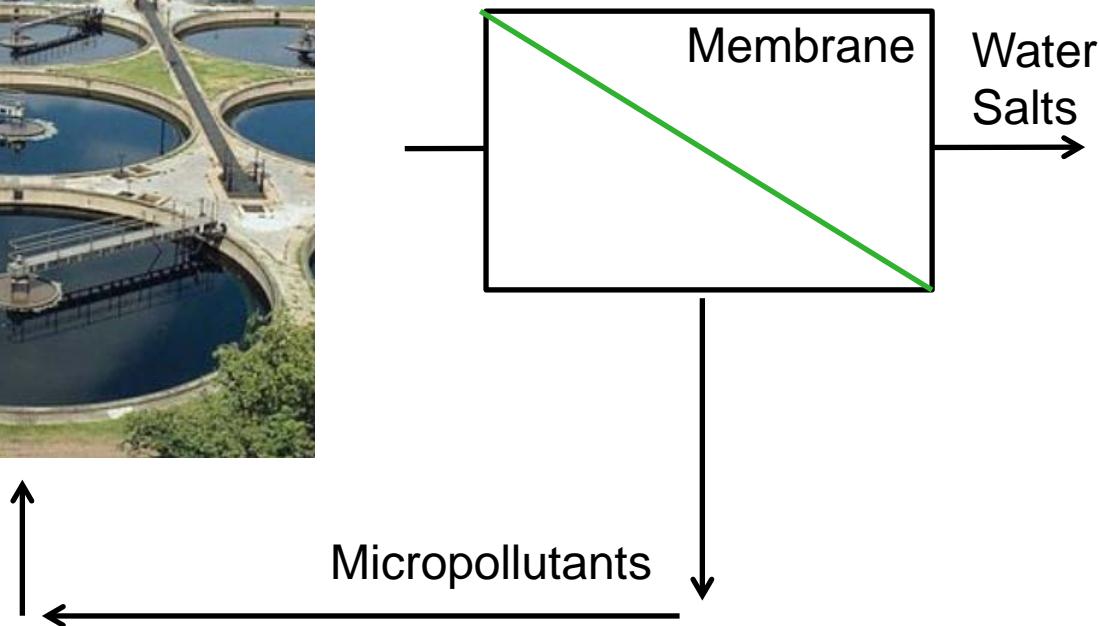


Micropollutants



# A NEW PROCESS FOR WASTEWATER TREATMENT

---



# Pilot Scale

---



Foto Jaap Eijsker

UNIVERSITY OF TWENTE.

**nx** filtration

# Acknowledgements!

## *Former Group Members*

**Joris de Groot**

Erik Vriezekolk

Shazia Ilyas

Timon Rijnaarts

Terica Sinclair

Mehran Abtahi

Namik Akkilic

Janneke Dickhout,

Dennis Reurink

**Elif Nur Durmaz**

Josh Willott

**Wouter Nielen**

Bob Siemerink

**Ettore Virga**

## *Current Group Members*

**Wendy Jonkers**

Irshad Baig

Jérémie van Lente

Lijie Li

Tjerk Watt

**Esra te Brinke**

**Jurjen Regenspurg**

Tao Wang

**Iske Achterhuis**

Ameya Bysani

Lily Li

Moritz Junker

Annemarie Maan

