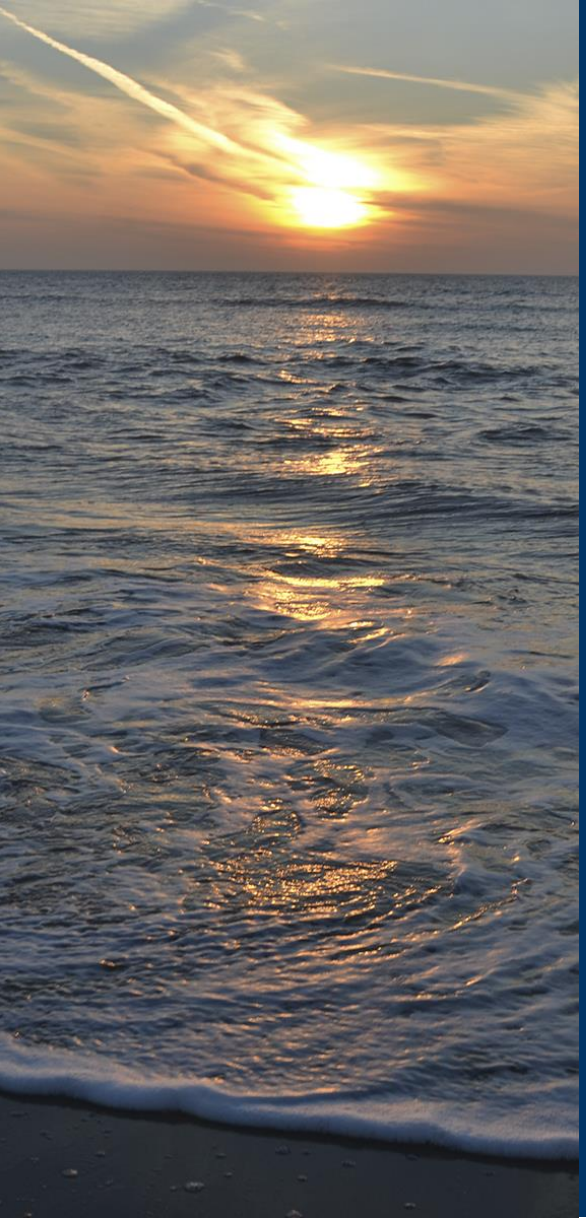

Separate NOM and salts in ion exchange brine with ceramic nanofiltration

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Luuk Rietveld
Ran Shang
Bas Heijman

Delft University of Technology

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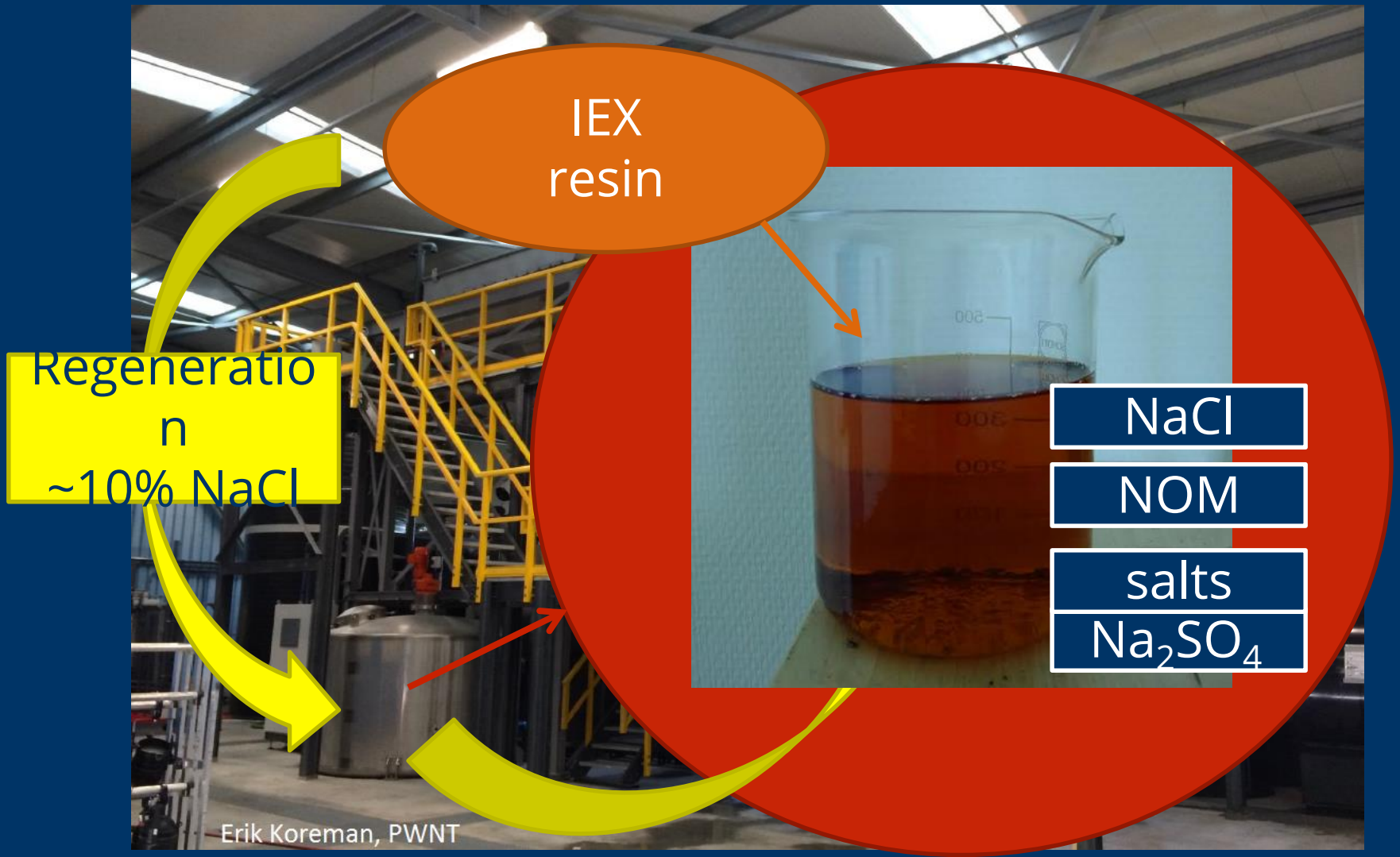
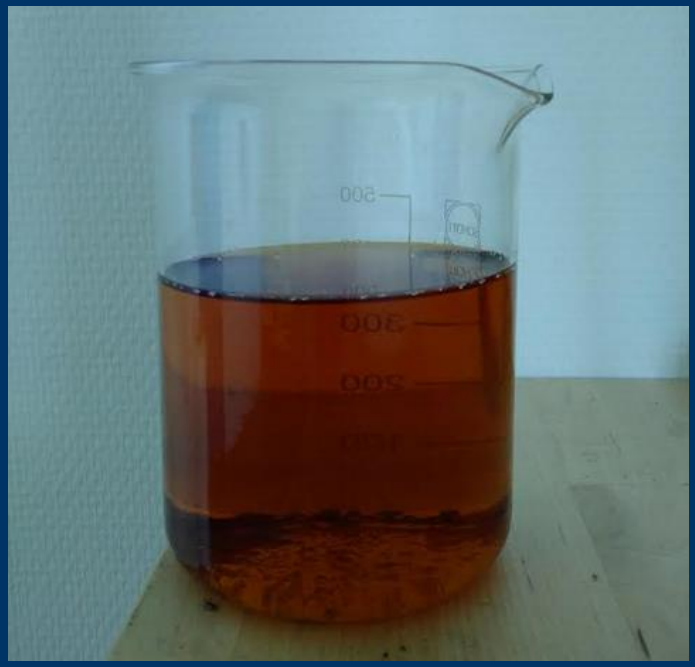
NOM removal by Ion Exchange (IEX)



Problem: brine disposal



- High costs
- Environmental impact
- Regulations

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NOM-rich IEX brine: resources

Food industry / Agriculture

Reuse regeneration salt

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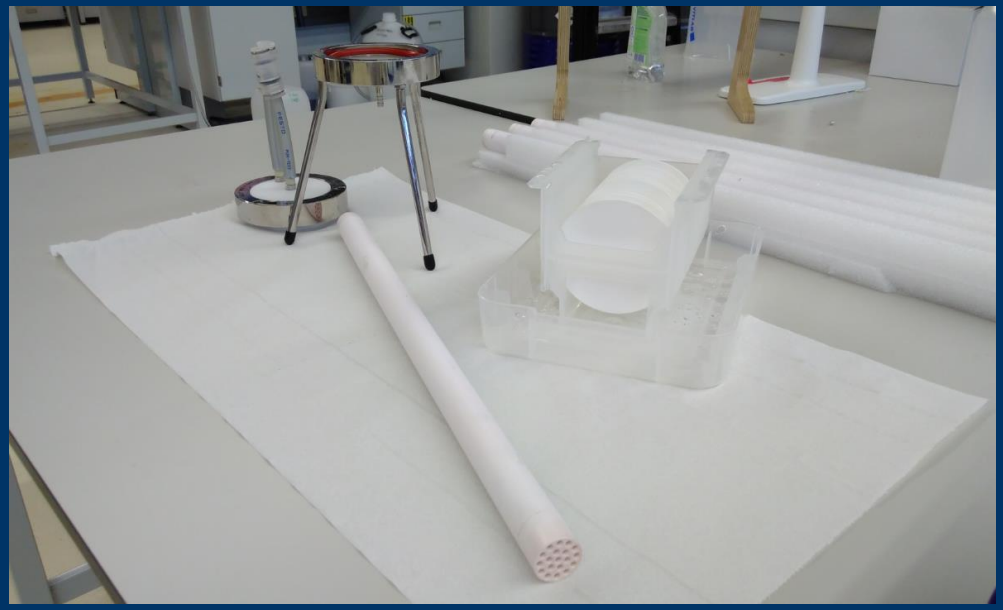
Approach: Ceramic Nanofiltration



- Strength and resistance
- Tolerance to high cross flow
- Less fouling
- Passage of Cl^-

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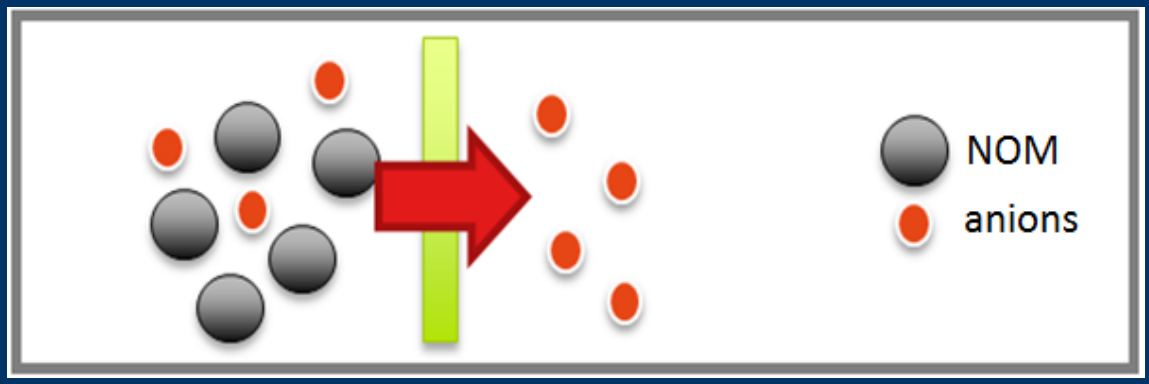
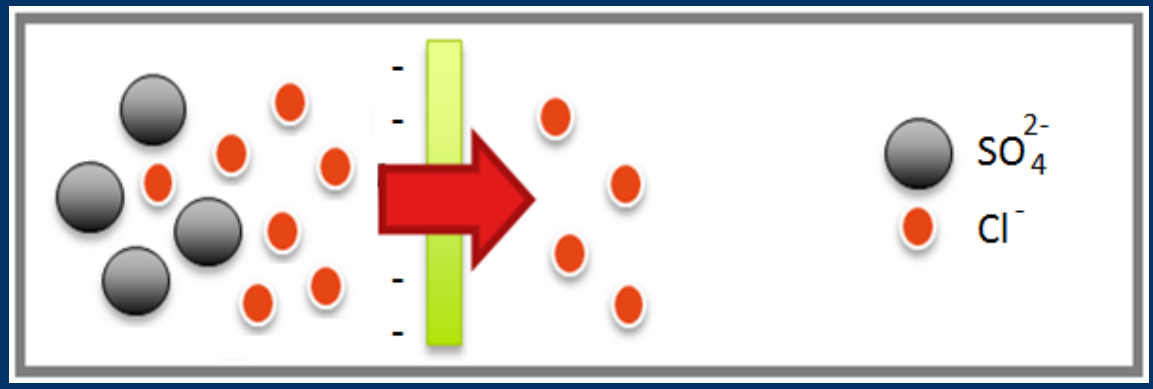
Separation mechanisms

Low ionic strength

- NOM and ions: size



- SO_4^{2-} and Cl^-: charge



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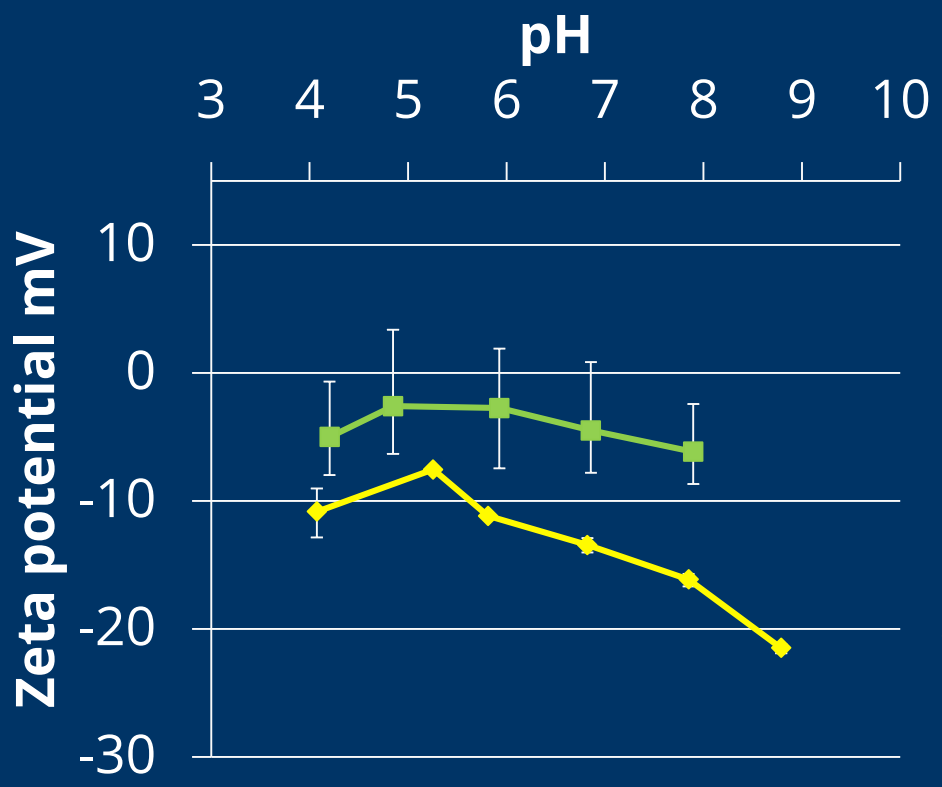
Membrane charge

High ionic strength



0.01 M NaCl

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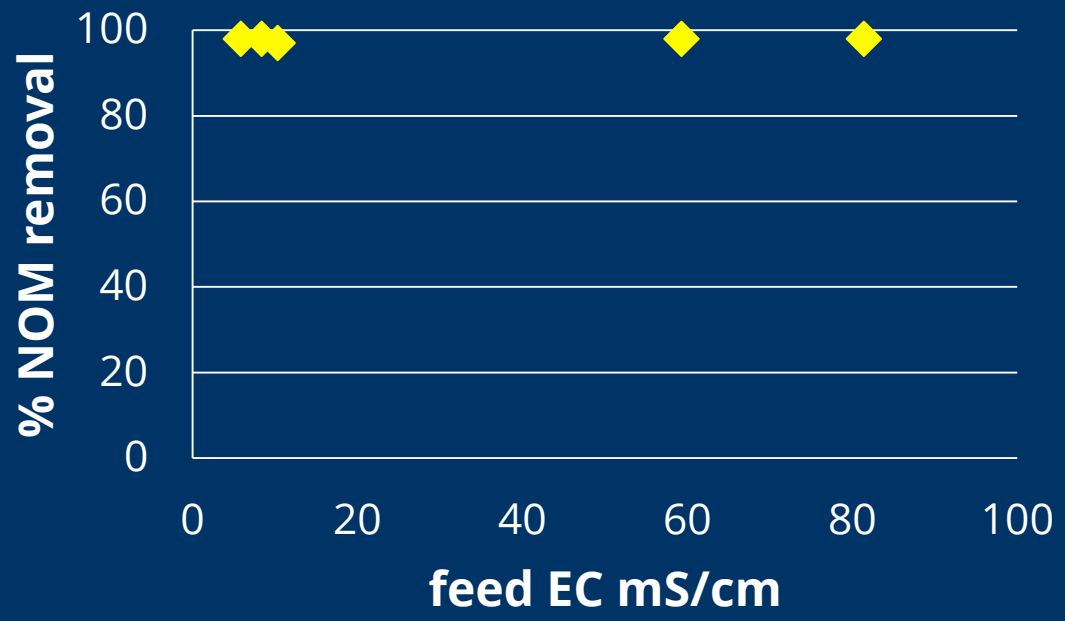
High NOM removal: steric rejection

Loose nanofiltration



MWCO 600 Da, pH 8,
flux 30-43 LMH,
0.5 gC/L of NOM 1

- NOM removal independent from charge, ionic strength, solution

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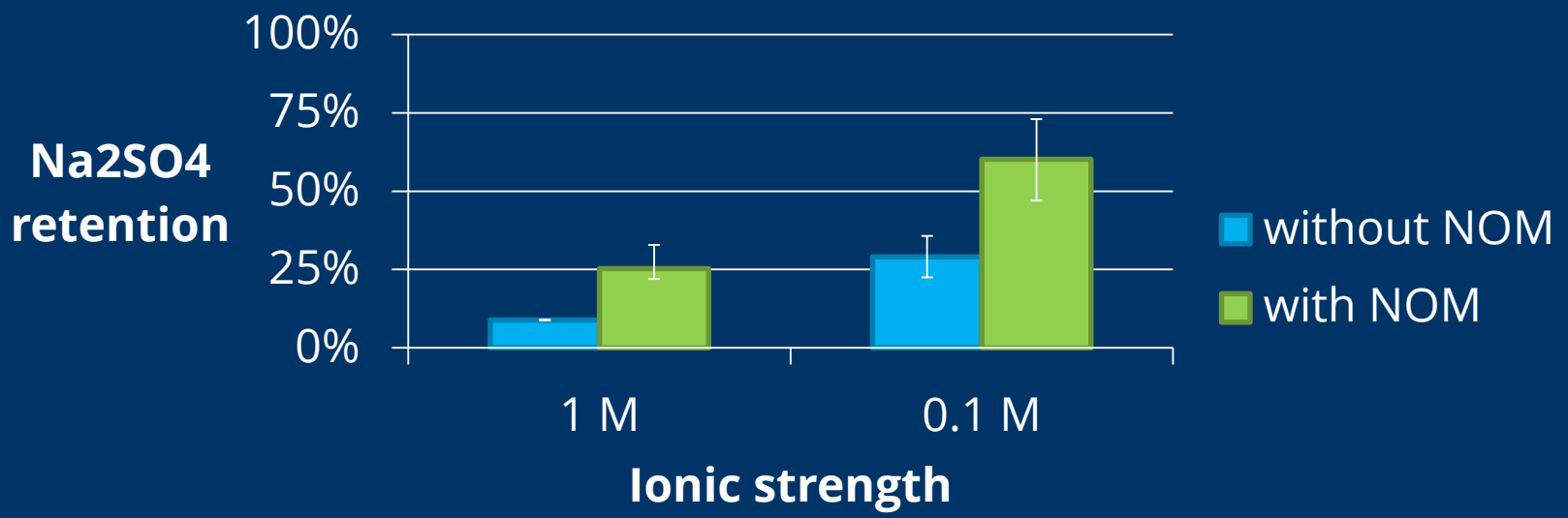
Low separation of SO_4^{2-} and Cl^-

Loose nanofiltration



- Low rejection of NaCl: 4 to -14%
- NOM improves Na_2SO_4 rejection

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Customized pore size

Looser filtration

Separation NOM and anions

Tighter filtration

Retention SO_4^{2-} Recovery Cl^-

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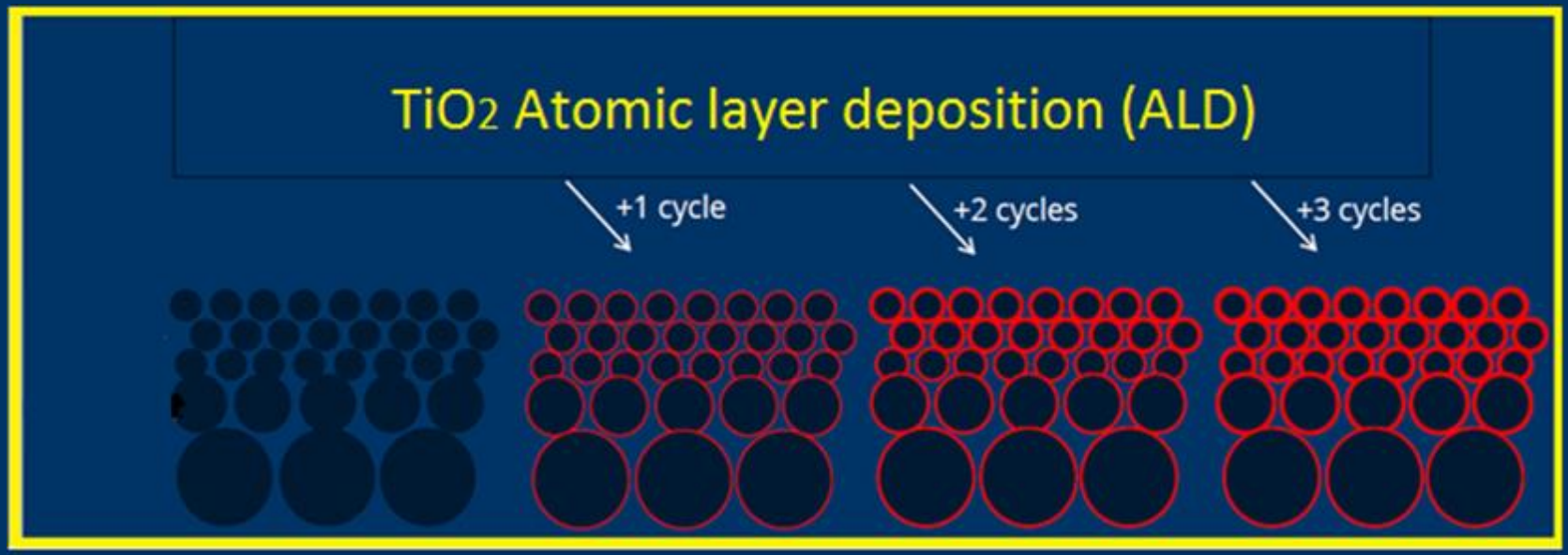
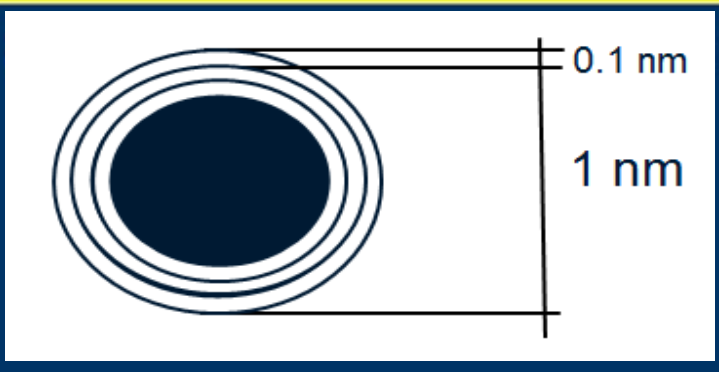
Atomic Layer Deposition (ALD)



- 3000 Da to 1900 Da
- 900 Da to 600 Da
- Aim: 300-350 Da



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Summary

- Recover NOM and regeneration salt from ion exchange brine
- Ceramic nanofiltration
- High ionic strength: custom pore size

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Thank you!

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