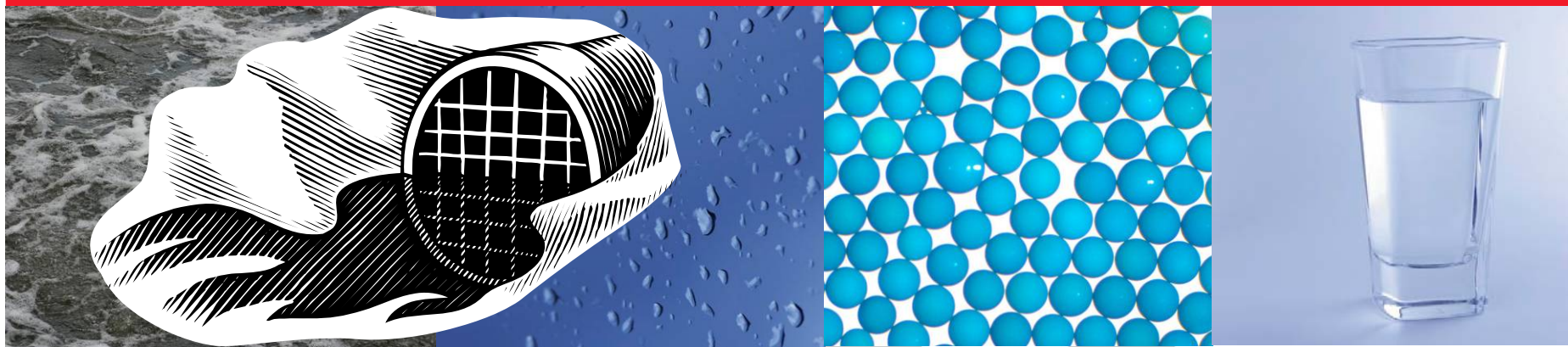


New Approaches to the Removal of Trace Impurities from Aqueous Solutions with Selective Adsorber Resins



7th Everything About Water Expo
Chennai, India, January 2010

Dr. Rudolf Wagner, Dr. Stefan Neumann
Manager Technical Marketing Ion Exchange Applications



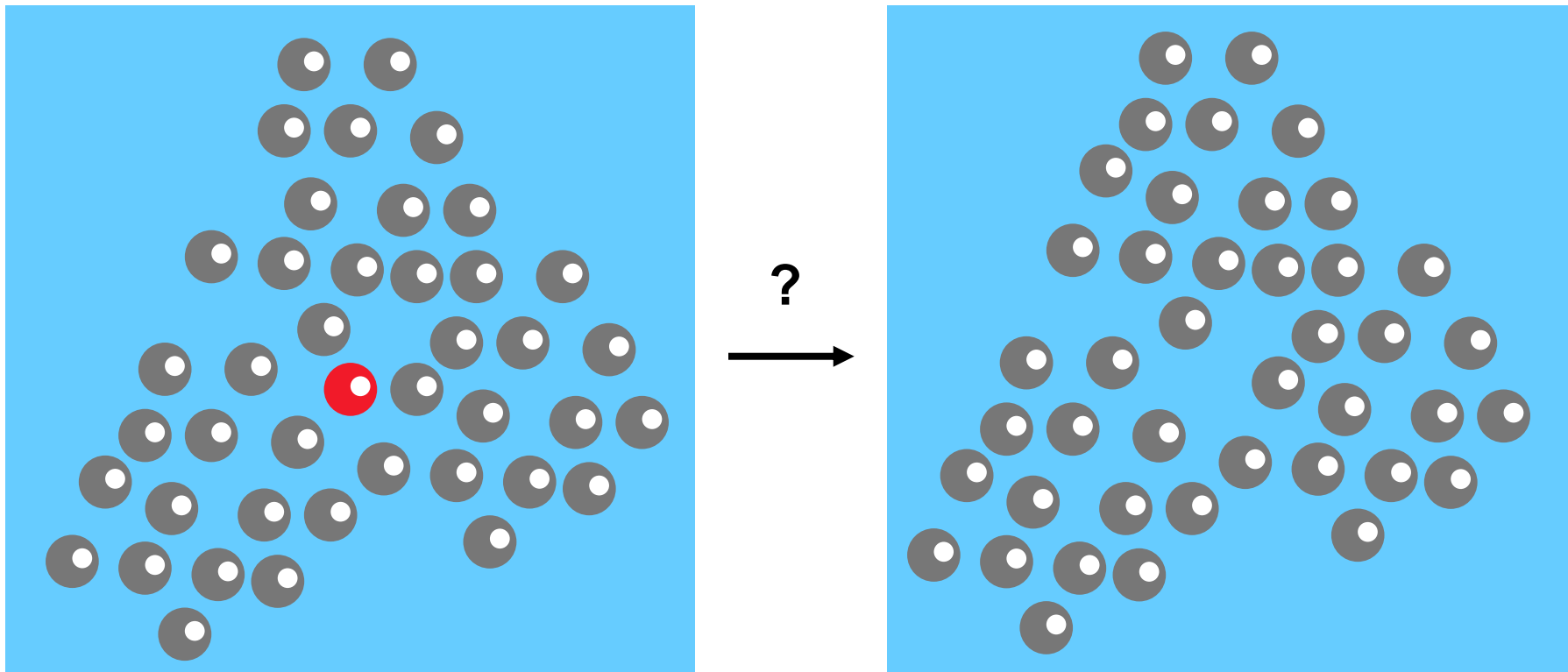
LANXESS
Energizing Chemistry

Content



1	Selective Adsorption
2	Characterization of Selective Filtration Processes
3	Examples for Applications
4	Summary/Conclusion

Trace Impurity Removal from Water



: trace impurity in ppm, ppb or ppt concentration range



: neutral salt in ppm, g/l or % concentration range



Fields of Application



Waste Water Treatment



Potable Water Purification



Ground Water Remediation

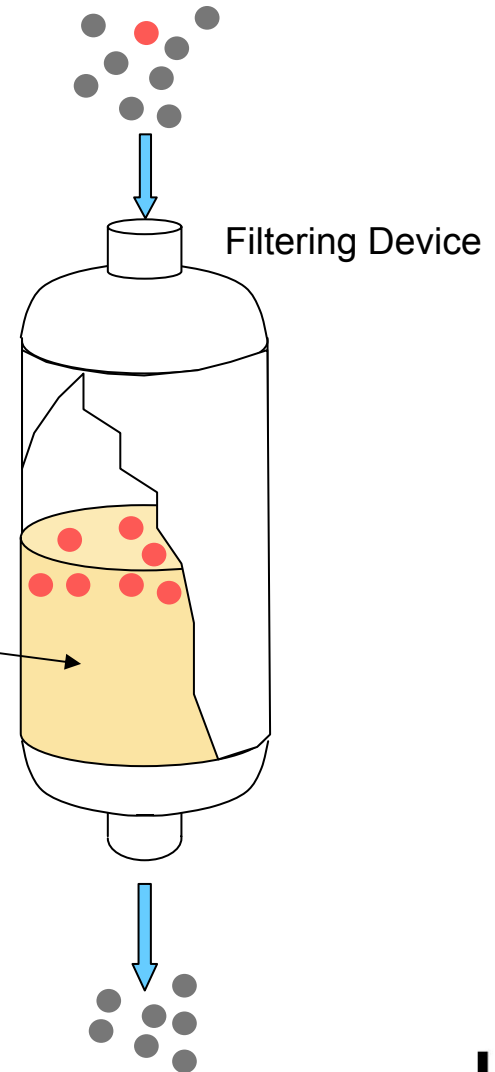


Product Purification

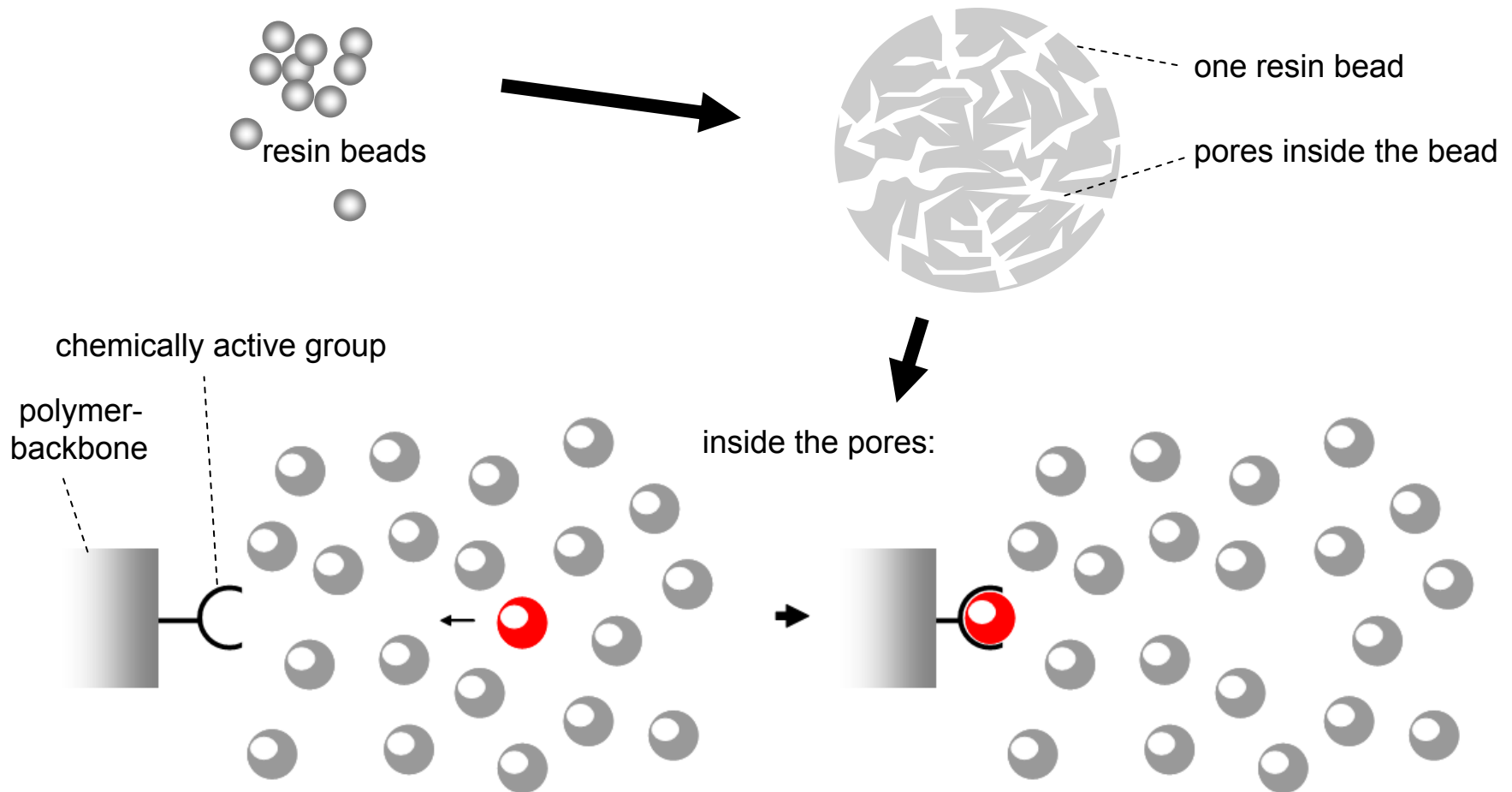
Selective Filtration



Selective Adsorber Resin



Selective Adsorption by Adsorber Resin



Advantages of Selective Adsorption Versus non-specific Adsorption



High removal rates (low filter leakage)



High capacity of filtering materials



Low secondary waste production



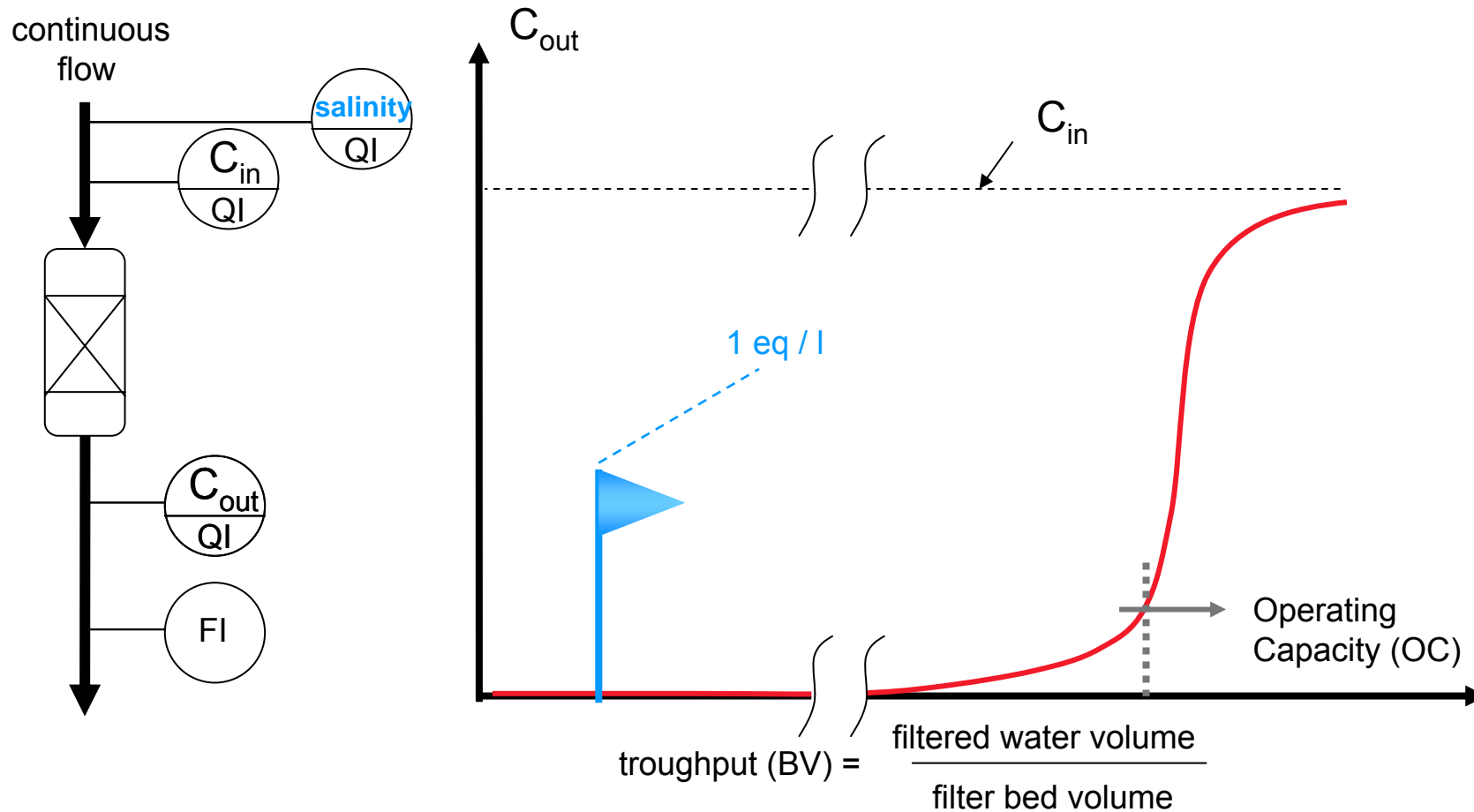
No loss of dissolved valuable material



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Filtration Curve (Break Through Curve)



Content

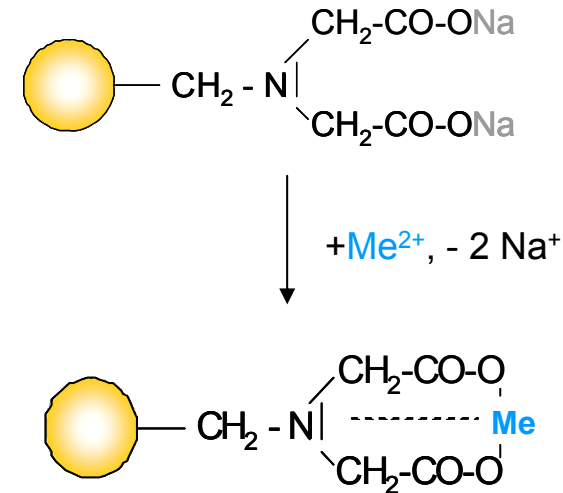
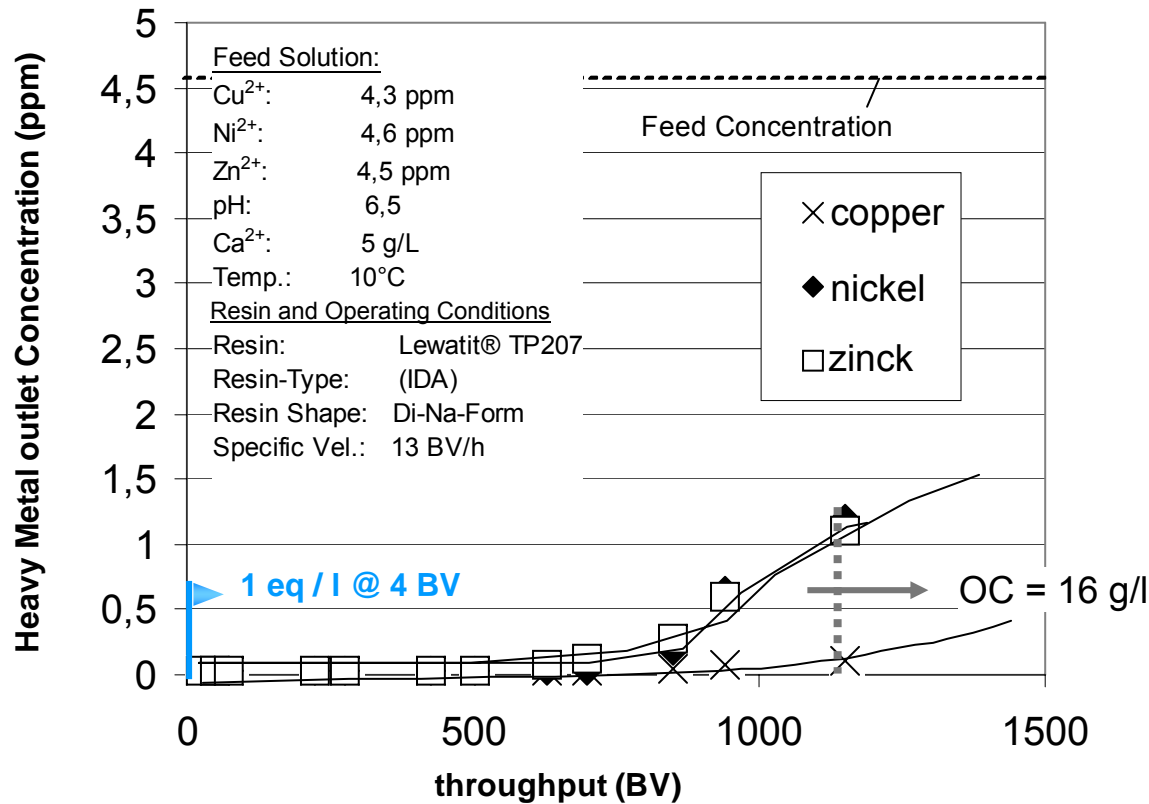


1	Selective Adsorption
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I) Well Established Processes



Removal of Heavy Metals (Cu²⁺, Ni²⁺, Zn²⁺) from Waste Water of Metal Working Plants

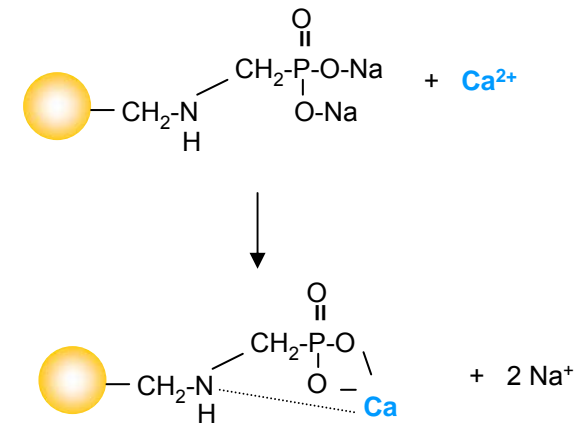
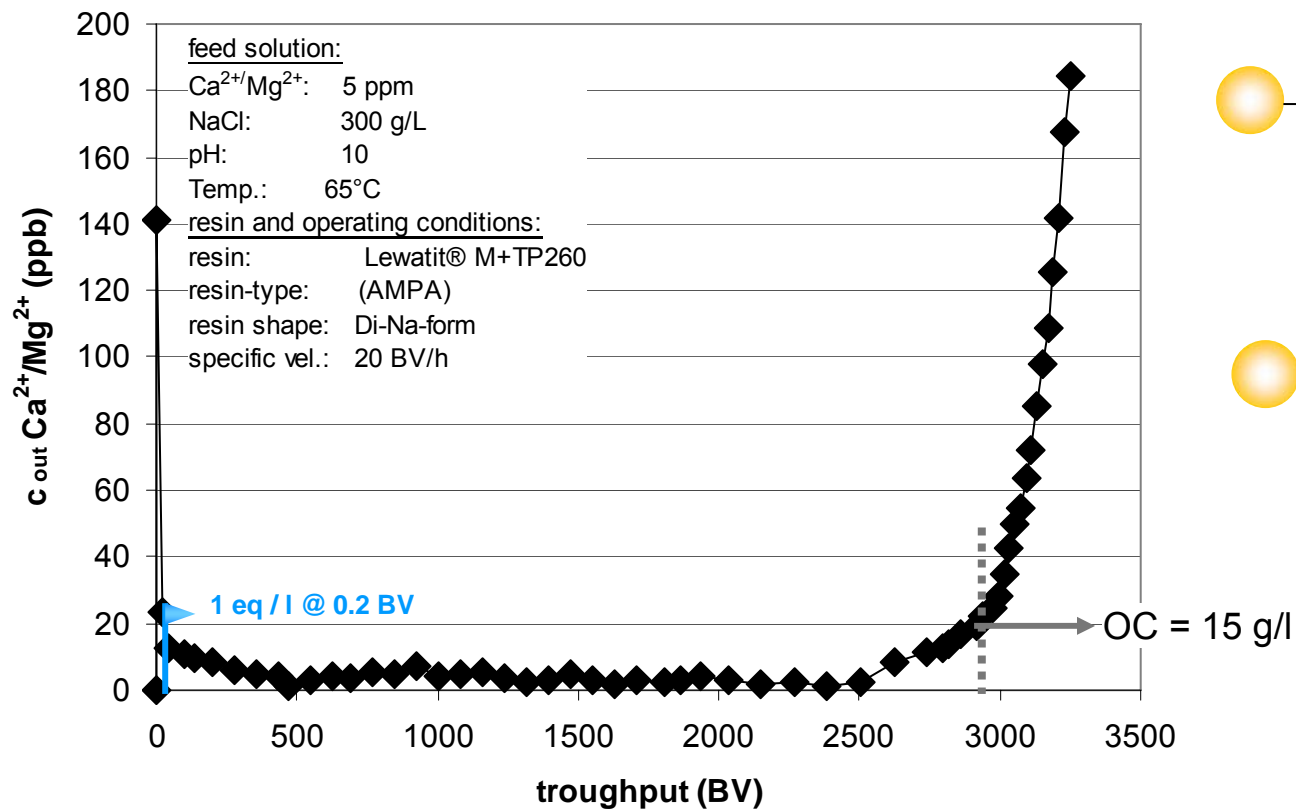


Regeneration:
 1) Acid
 2) Caustic

I) Well Established Processes



Removal of Hardness ($\text{Ca}^{2+}/\text{Mg}^{2+}$) from Saturated Brine

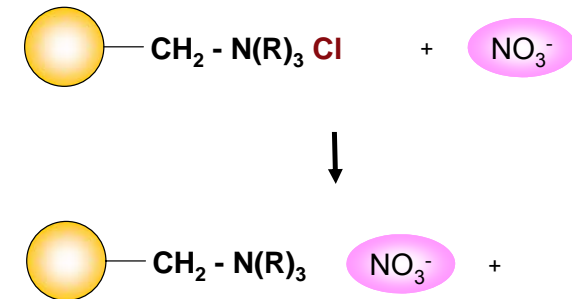
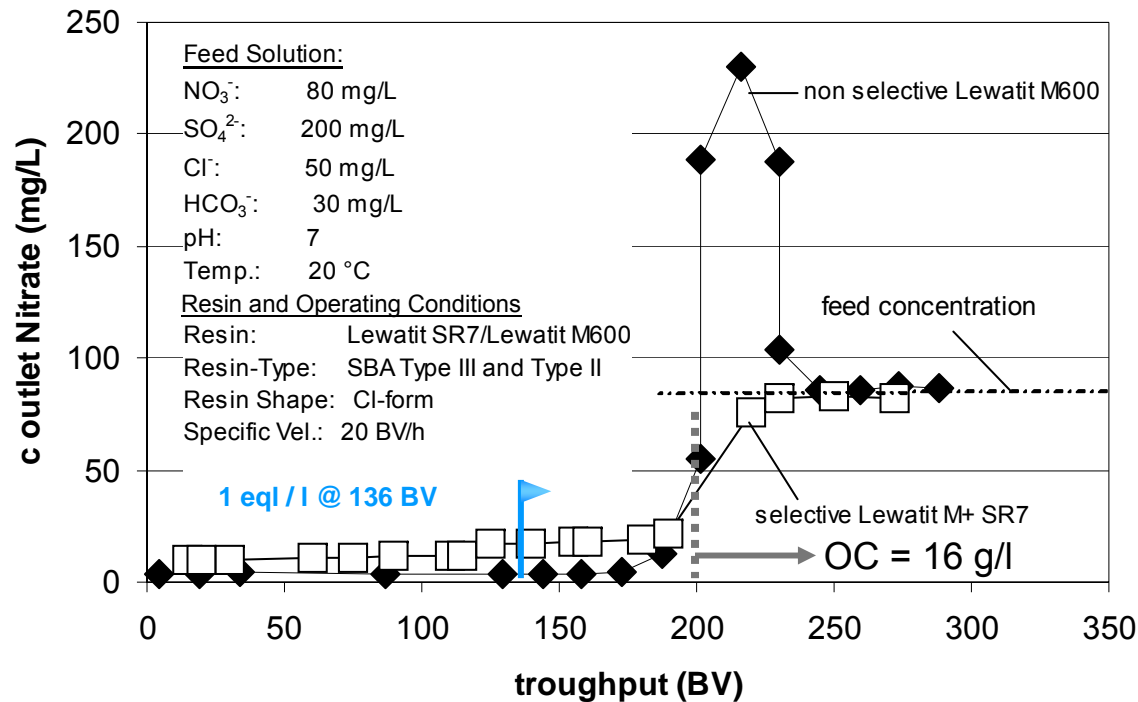


Regeneration:
 1) Acid
 2) Caustic

I) Well Established Processes



Removal of Nitrate (NO₃⁻) from Potable Water



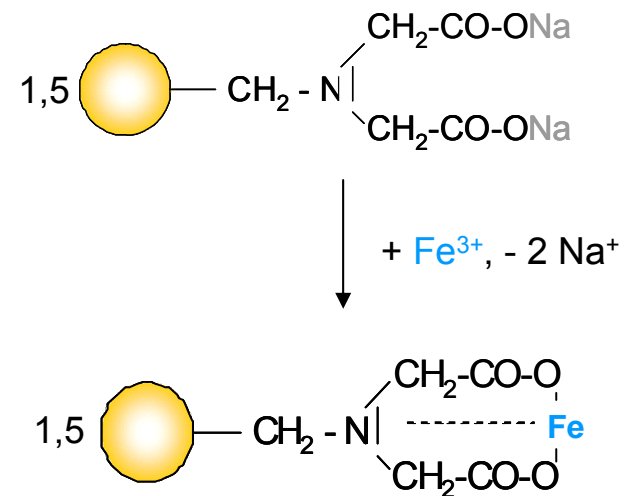
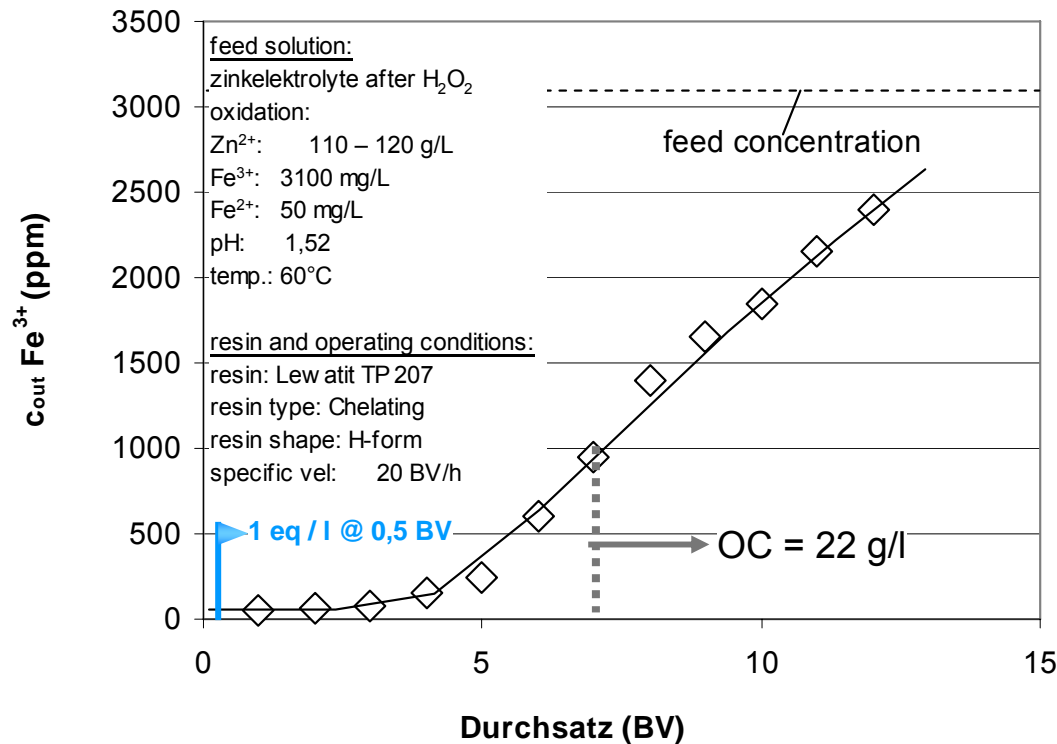
non selective resin: R = e.g. -CH₃
 selective resin: R = e.g. -CH₂-CH₃

Regeneration:
 NaCl brine

I) Well Established Processes



Removal of Iron (Fe^{3+}) from a Zink-Plating Bath

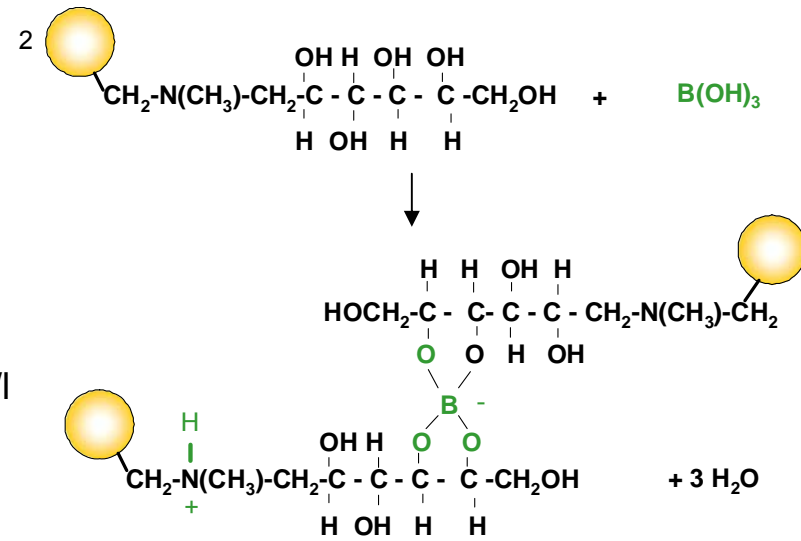
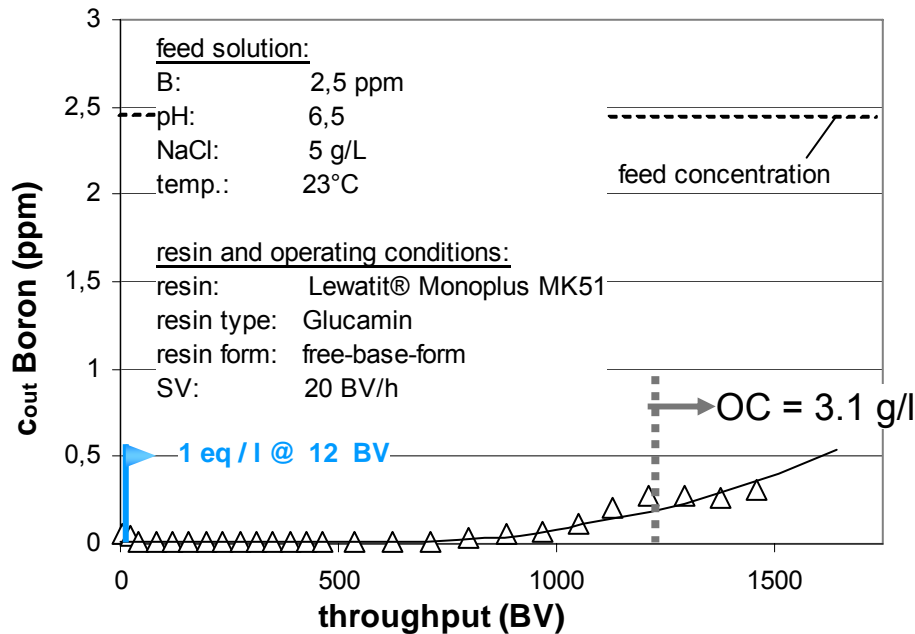


Regeneration:
Acid

II) Newer Processes



Removal of Boron ($B(OH)_3$) from Desalinated Seawater or Ceramic- and Glas-Industry Waste Water

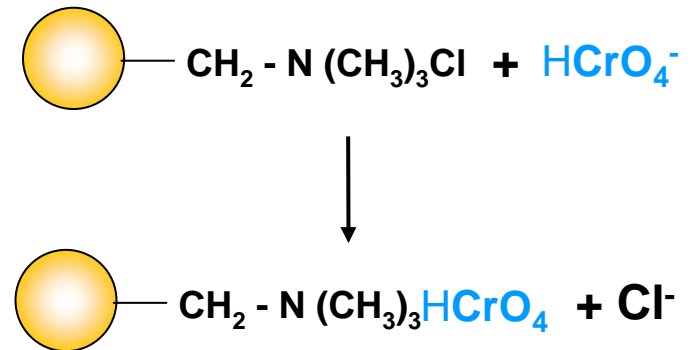
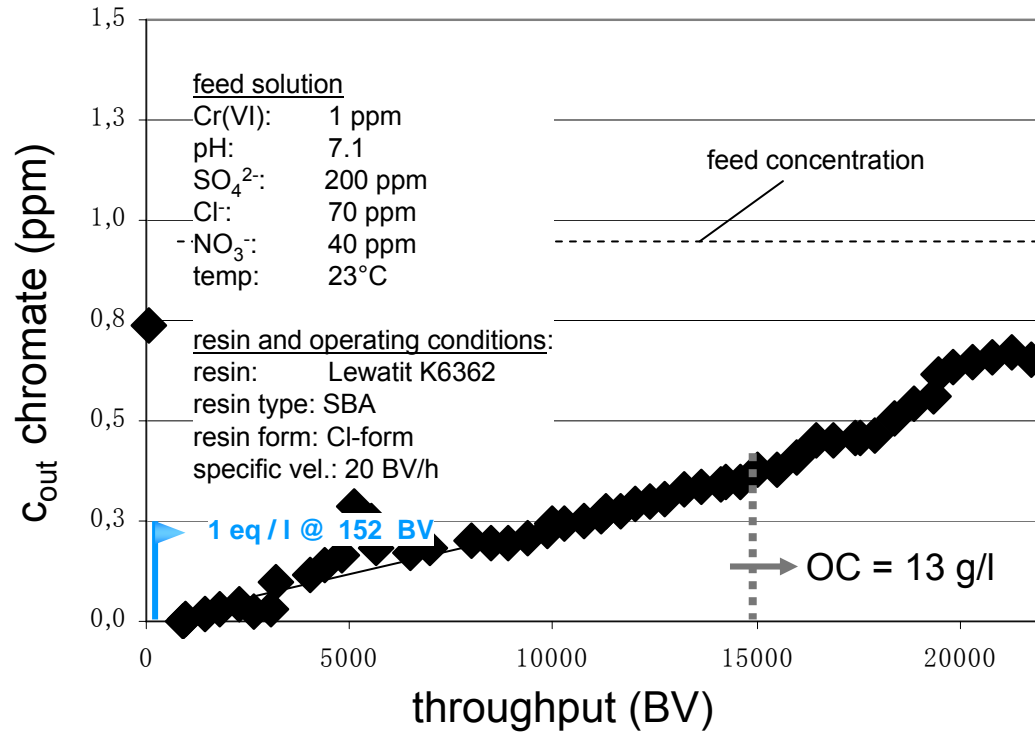


Regeneration:
 1) Acid
 2) Caustic

II) Newer Processes



Removal of Chromate (Cr(VI)) from contaminated Groundwater

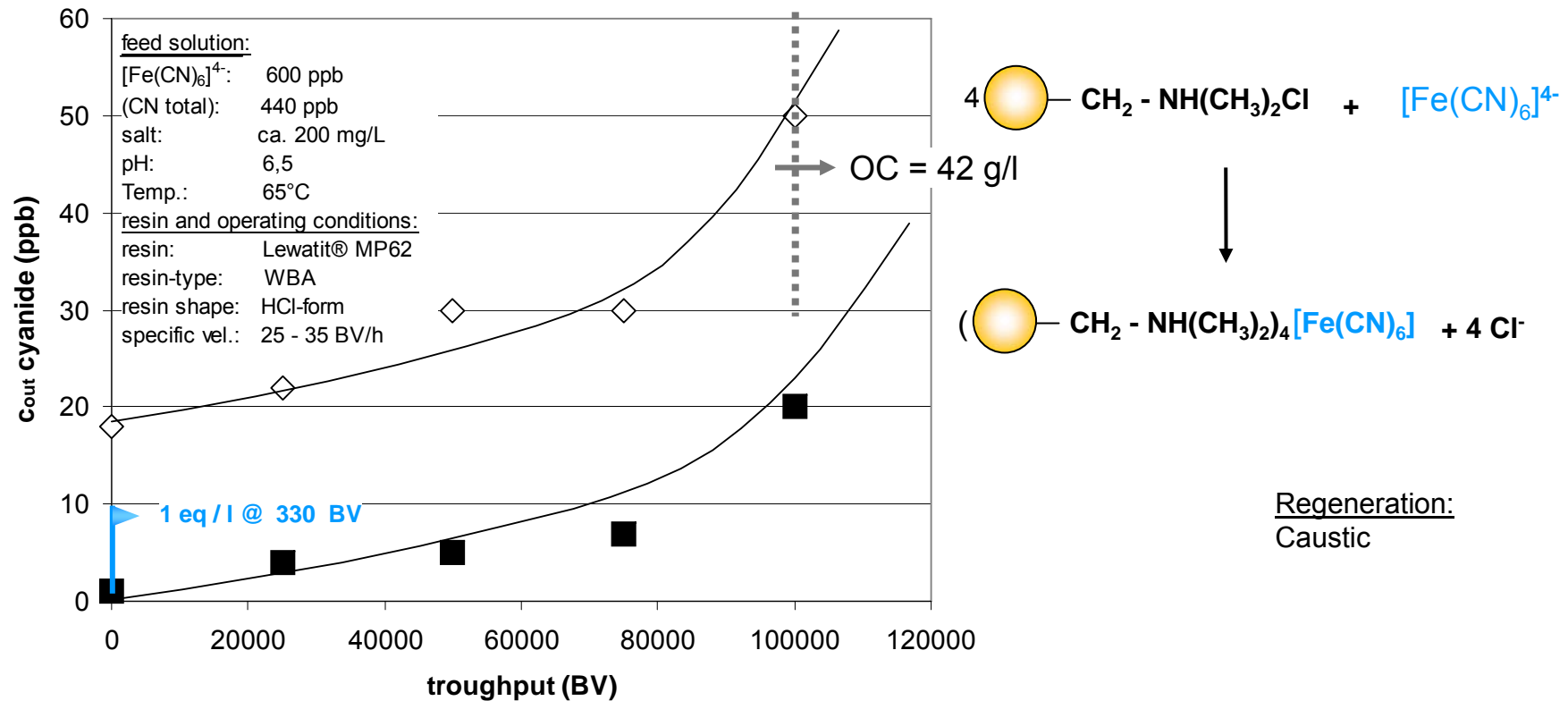


Regeneration:
Not possible

II) Newer Processes



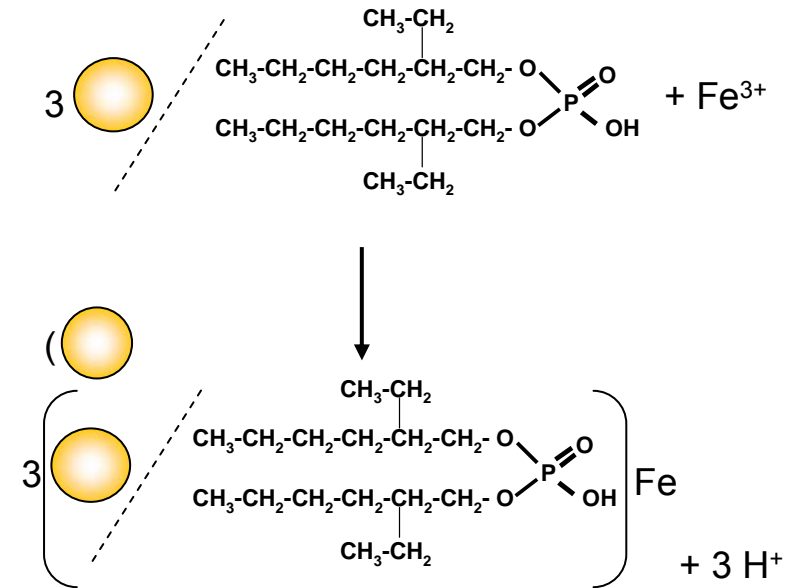
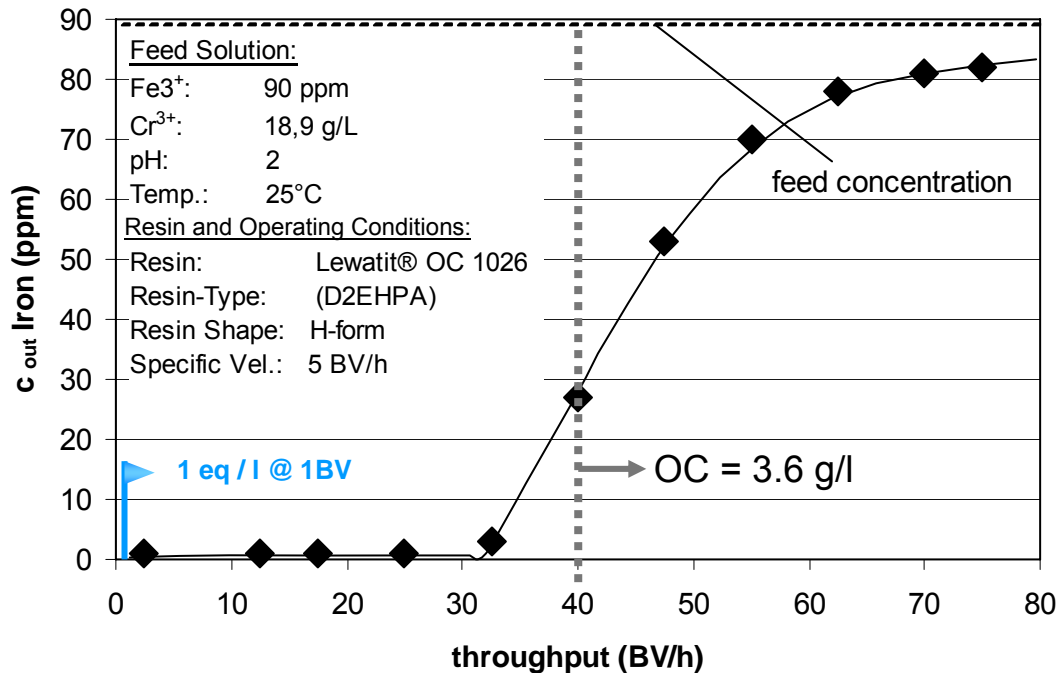
Removal of complexed Cyanide $[\text{Fe}(\text{CN})_6]^{4-}$ from contaminated Groundwater



II) Newer Processes



Removal of Iron (Fe^{3+}) from Chrome III passivation Bath

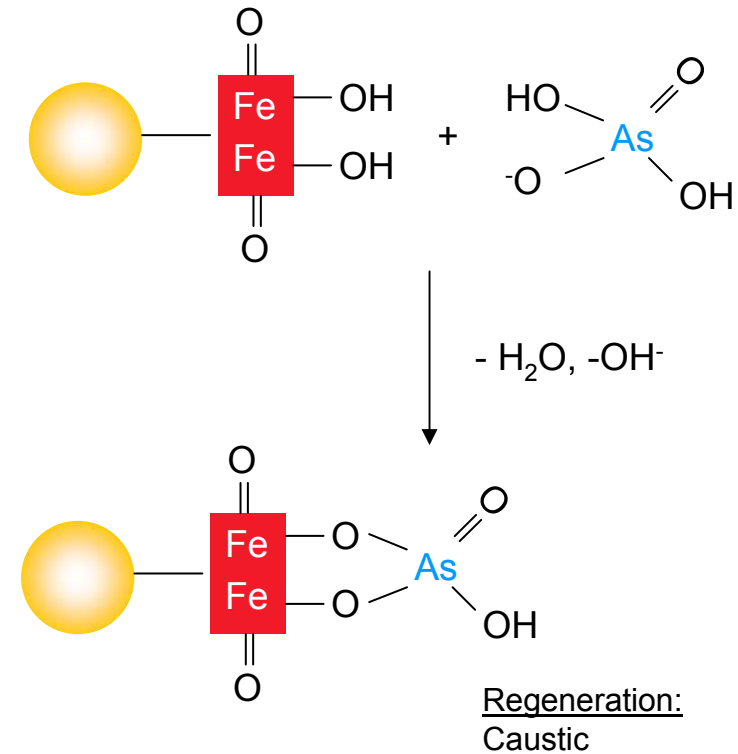
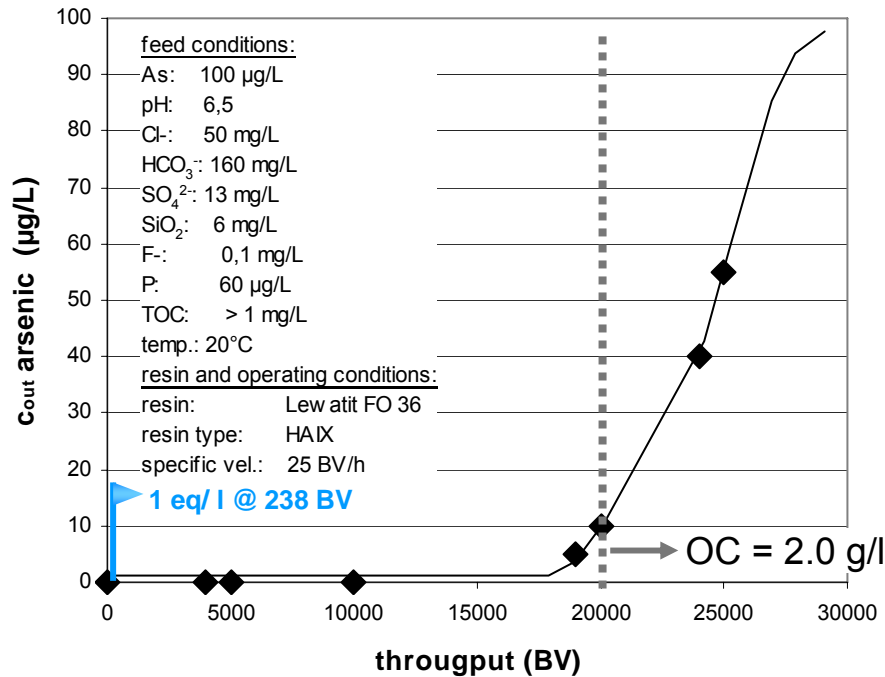


Regeneration:
Acid

III) New Approaches by Metal Doped Resin



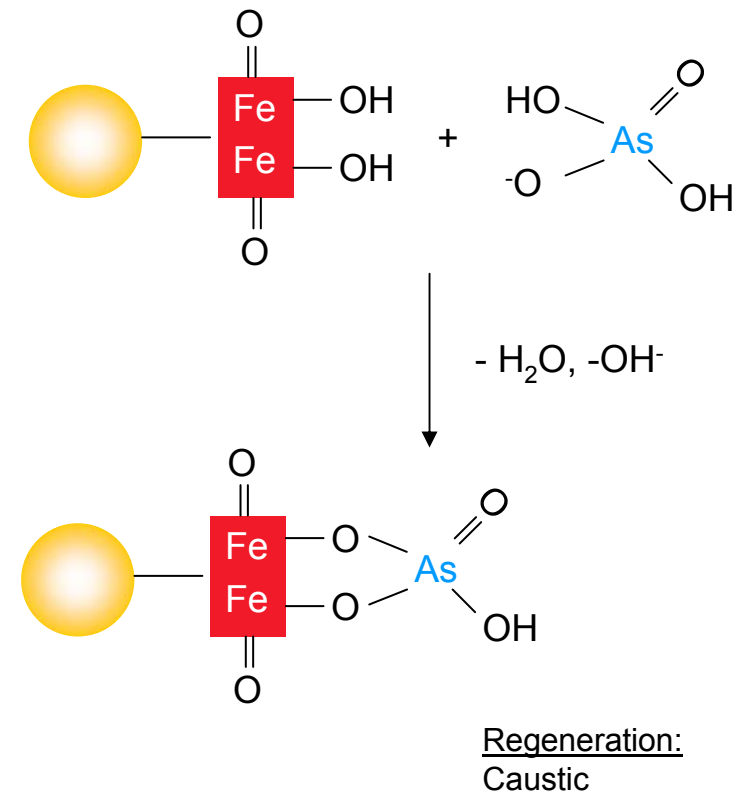
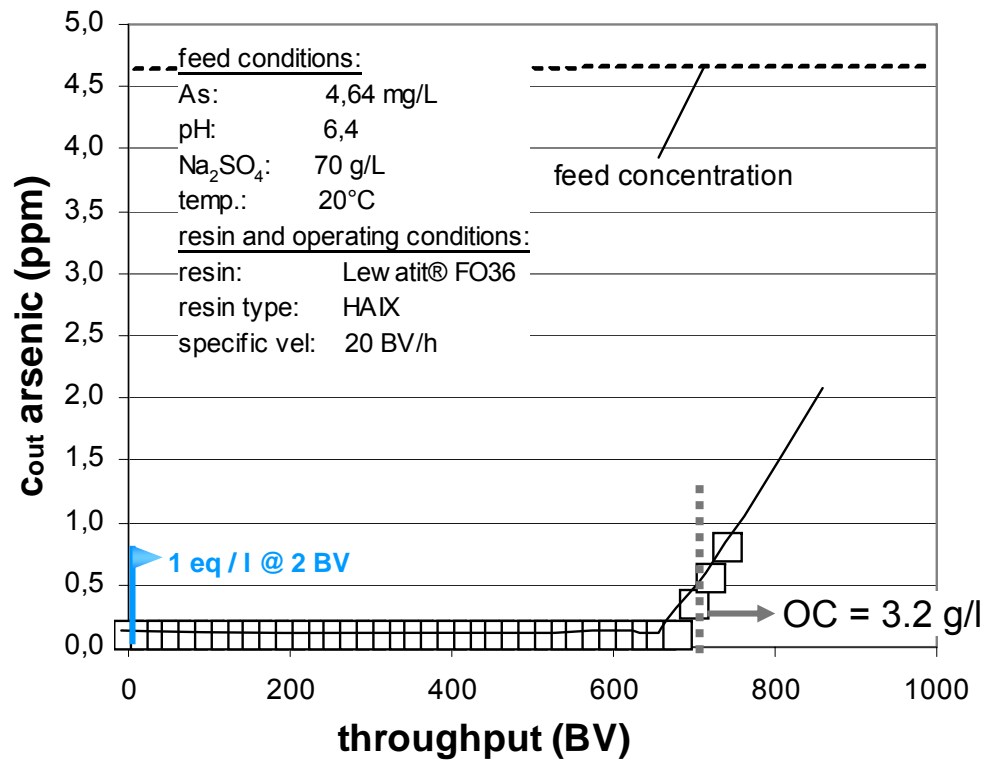
Removal of Arsenic (AsV) from remediated Groundwater or Potable Water



III) New Approaches by Metal Doped Resin



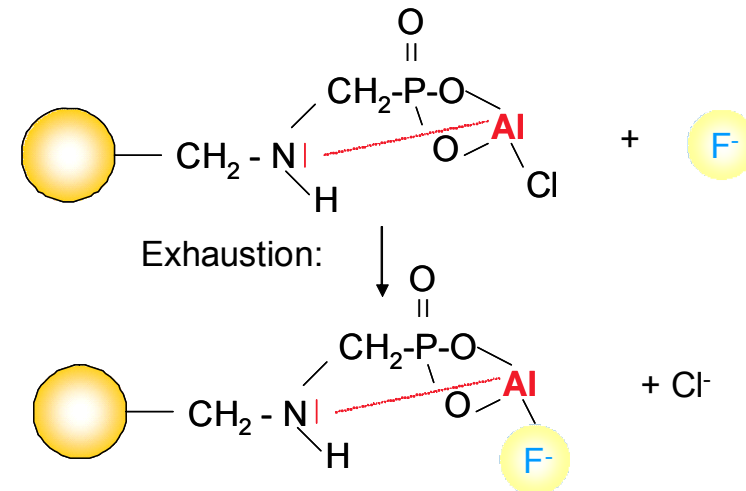
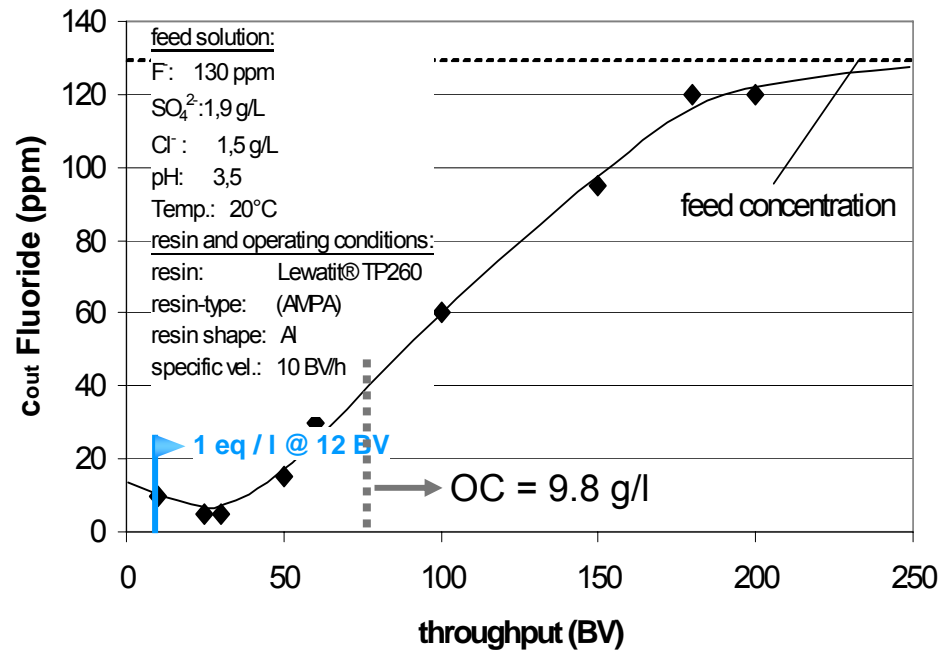
Removal of Arsenic (AsV) from Waste Water of Copper-Refineries



III) New Approaches by Metal Doped Resin



Removal of Fluoride (F⁻) from Glas-, Ceramic- and Semi-Conductor Production Waste Water

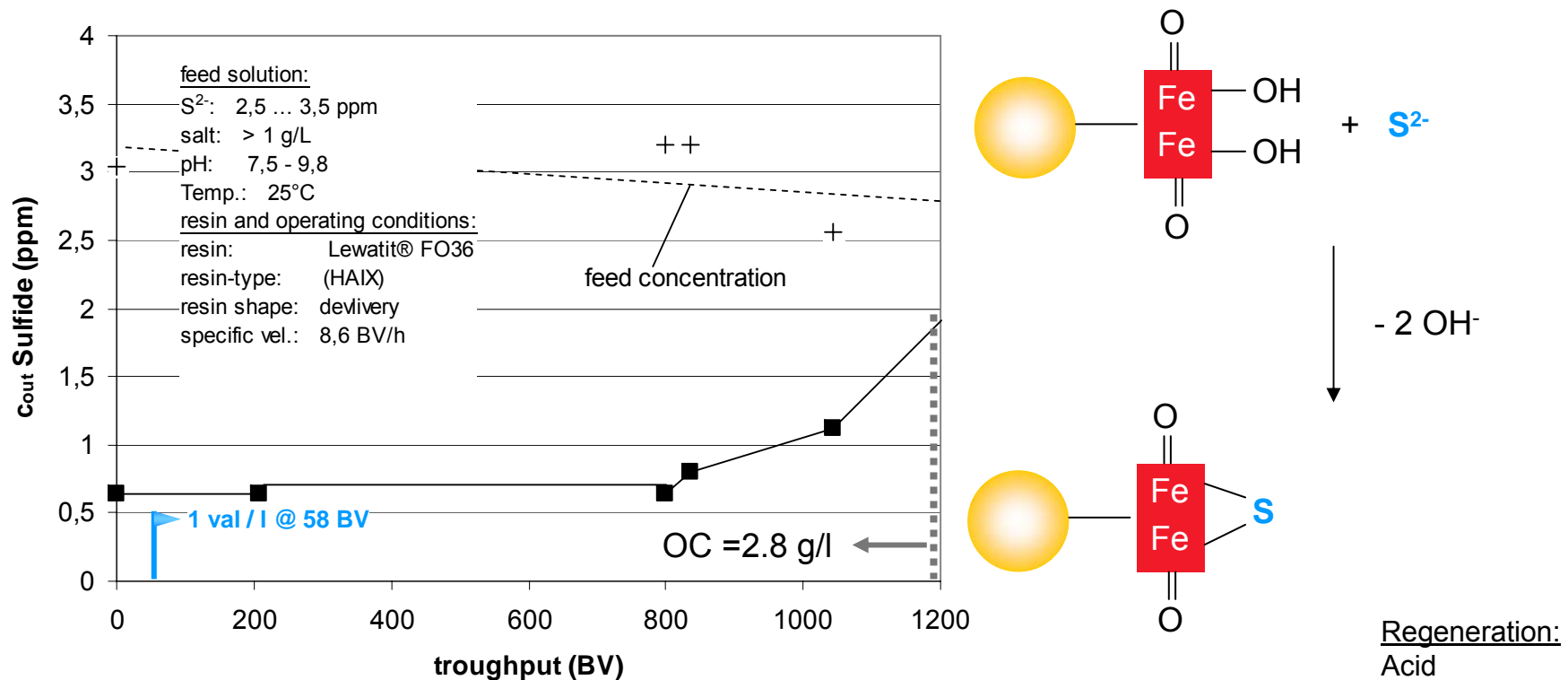


Regeneration:
AlCl₃ brine

III) New Approaches by Metal Doped Resin



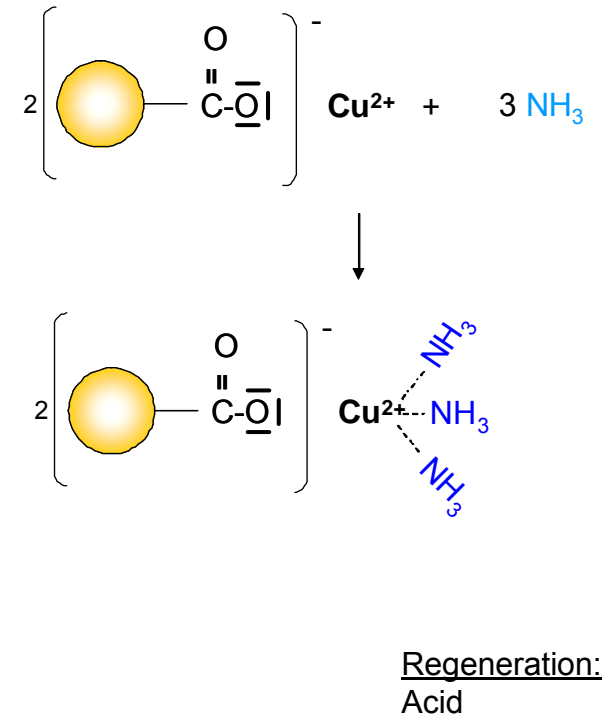
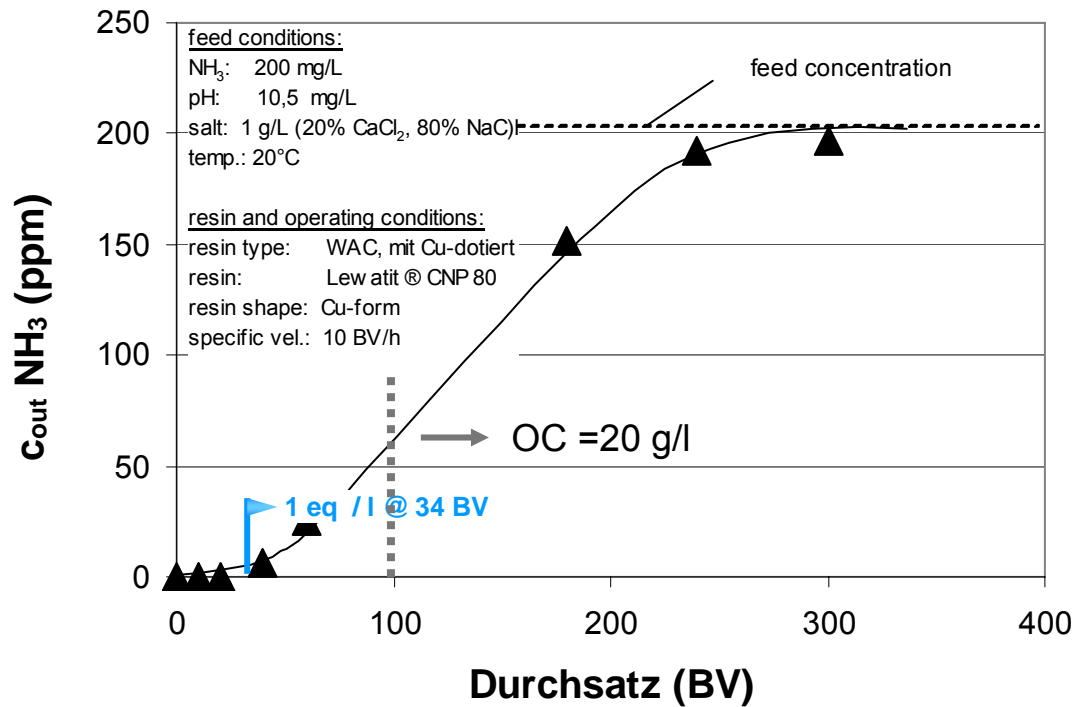
Removal of Sulfide (S^{2-}) from a viscose fibre producing factory



III) New Approaches by Metal Doped Resin



Removal of Ammonia (NH₃) from Salt Containig Waste Water



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Summary/Conclusion



- ♠ Selective Removal of Trace Impurities is of Interest in
 - Waste Water Treatment
 - Potable Water Purification
 - Ground Water Remediation
 - Chemicals Purification

- ♥ Selectiv Adsorber Resins can Effieciently Remove Trace Components by Binding them to Chemically Active Anchor Groups

- ♣ Some Examples of Elder Applications and new Approaches Demonstrate Feasibility

- ♦ More than 30 Different Products enable more than 300 Applications



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