Advanced High-Amp Dual Polarity Electrochemistry

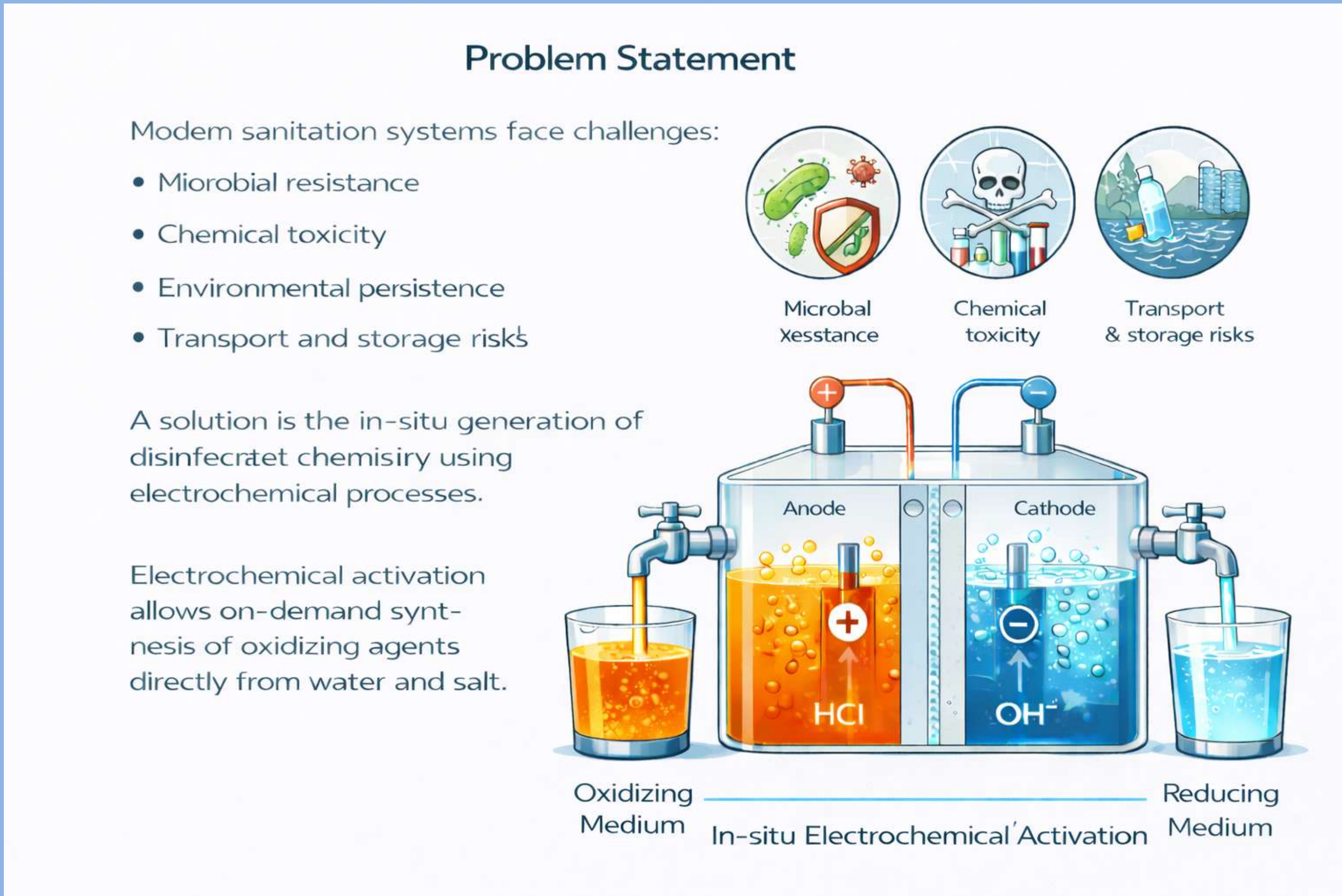
Ion Isolation Using Sodium Chloride Electrolyte Injection

Production of Dual Functional Electrochemical Solutions

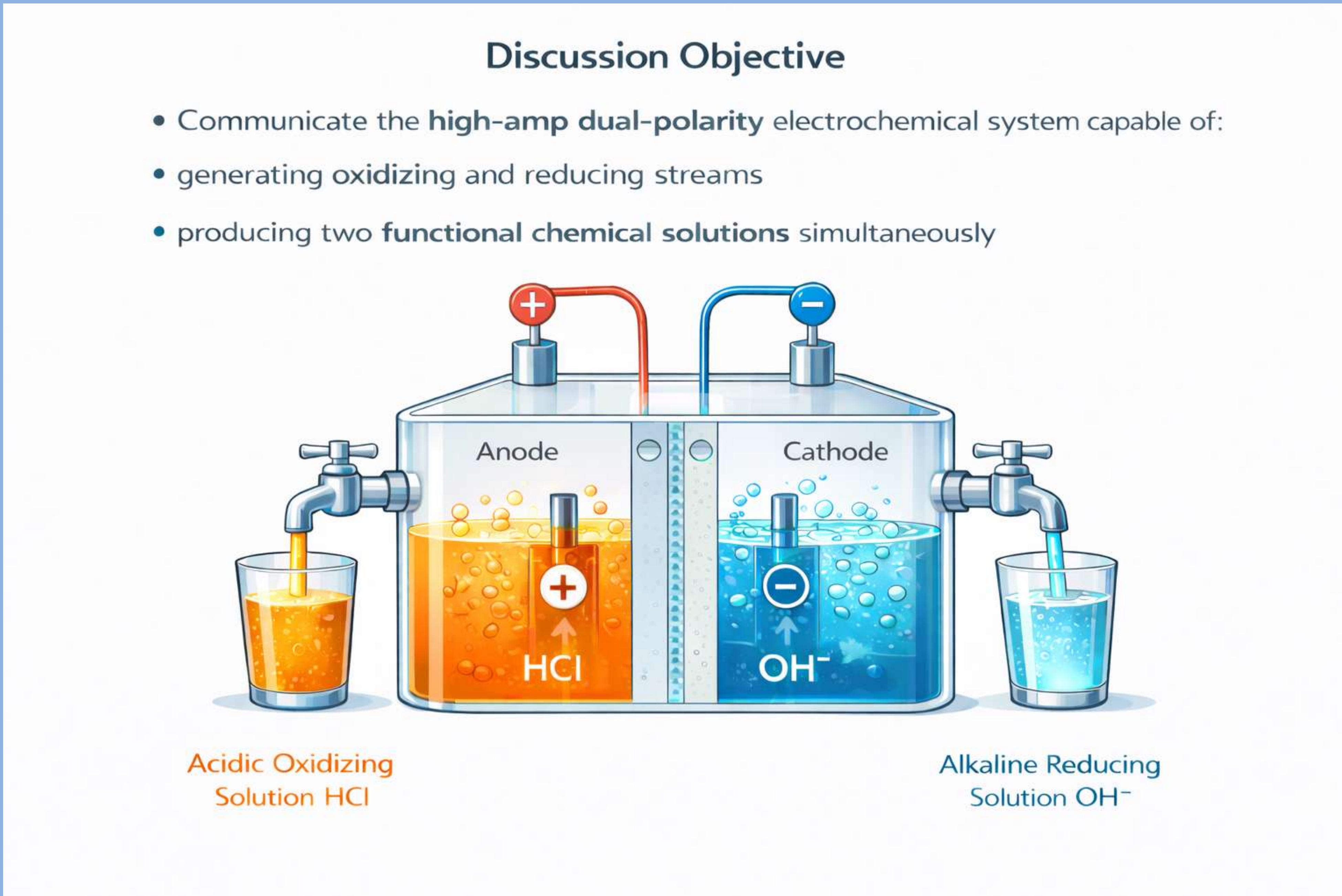
Slide 2 — Scientific Context

Research has expanded applications into Functional Electrolyzed Water systems, capable of producing oxidizing and reducing streams simultaneously These systems produce two chemically distinct aqueous solutions with unique redox properties

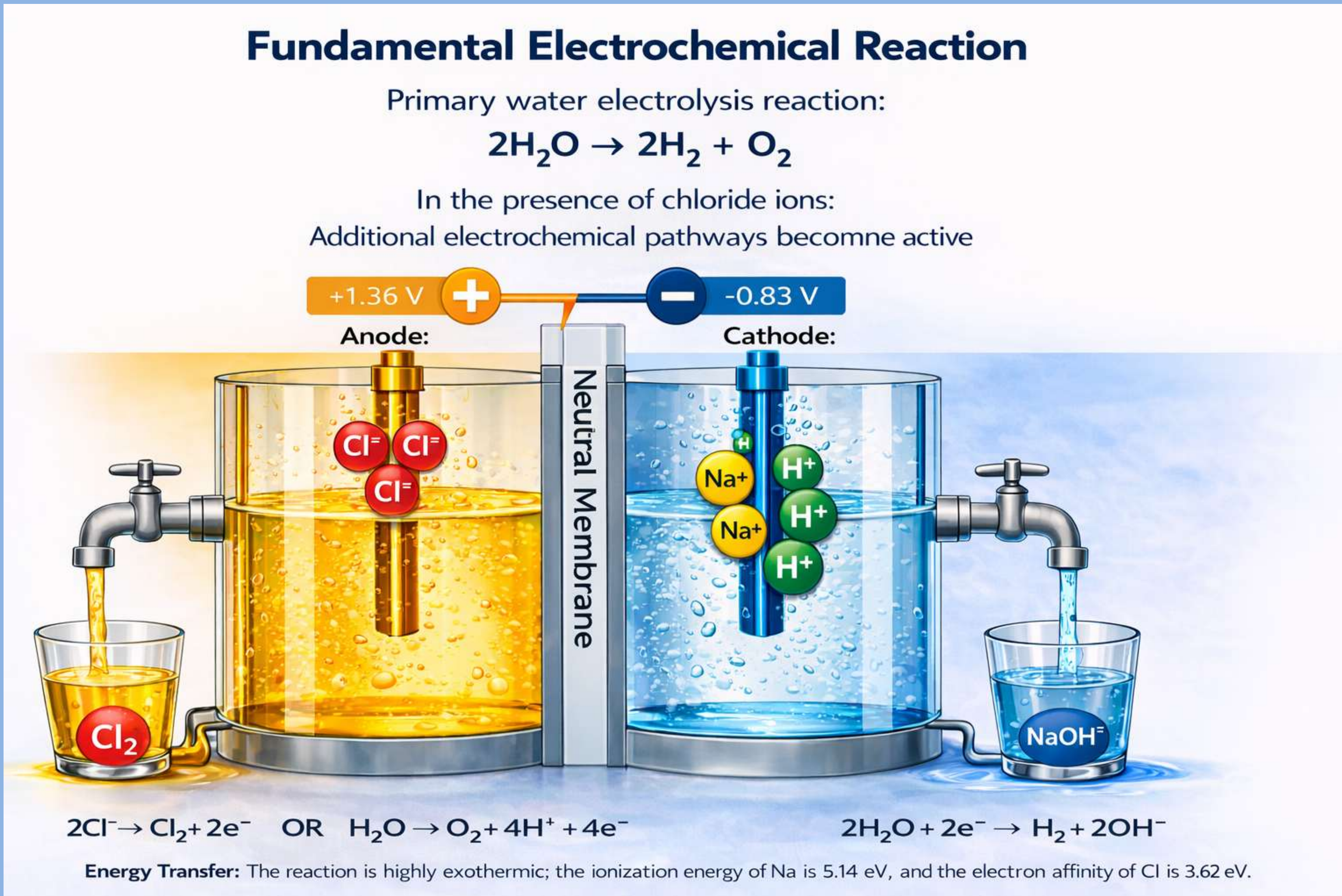
Slide 3 — Problem Statement



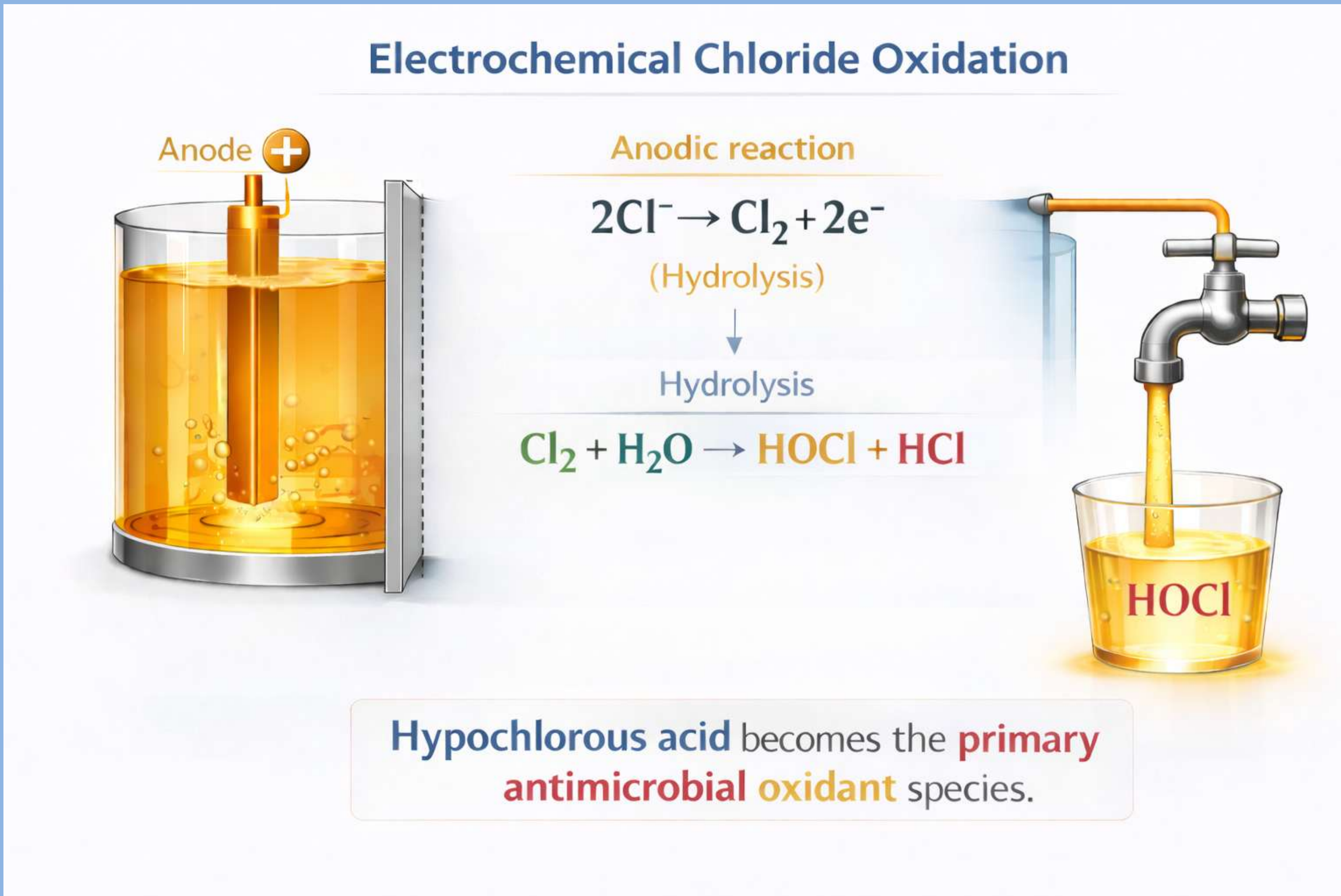
Slide 4 - Discussion objective - separating ionic species



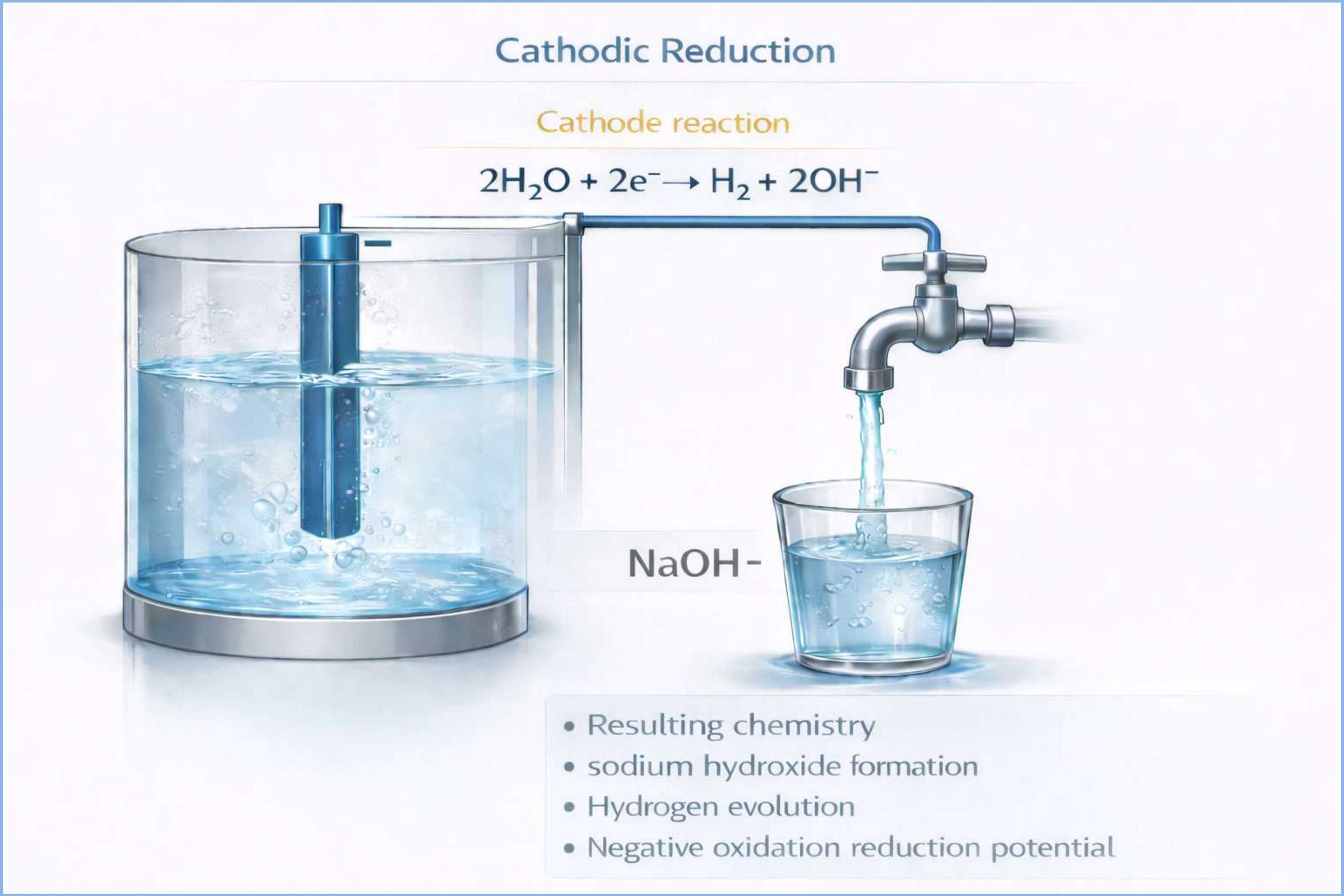
Slide 5 — Fundamental Electrochemical Reaction



Slide 6 — Electrochemical Chloride Oxidation

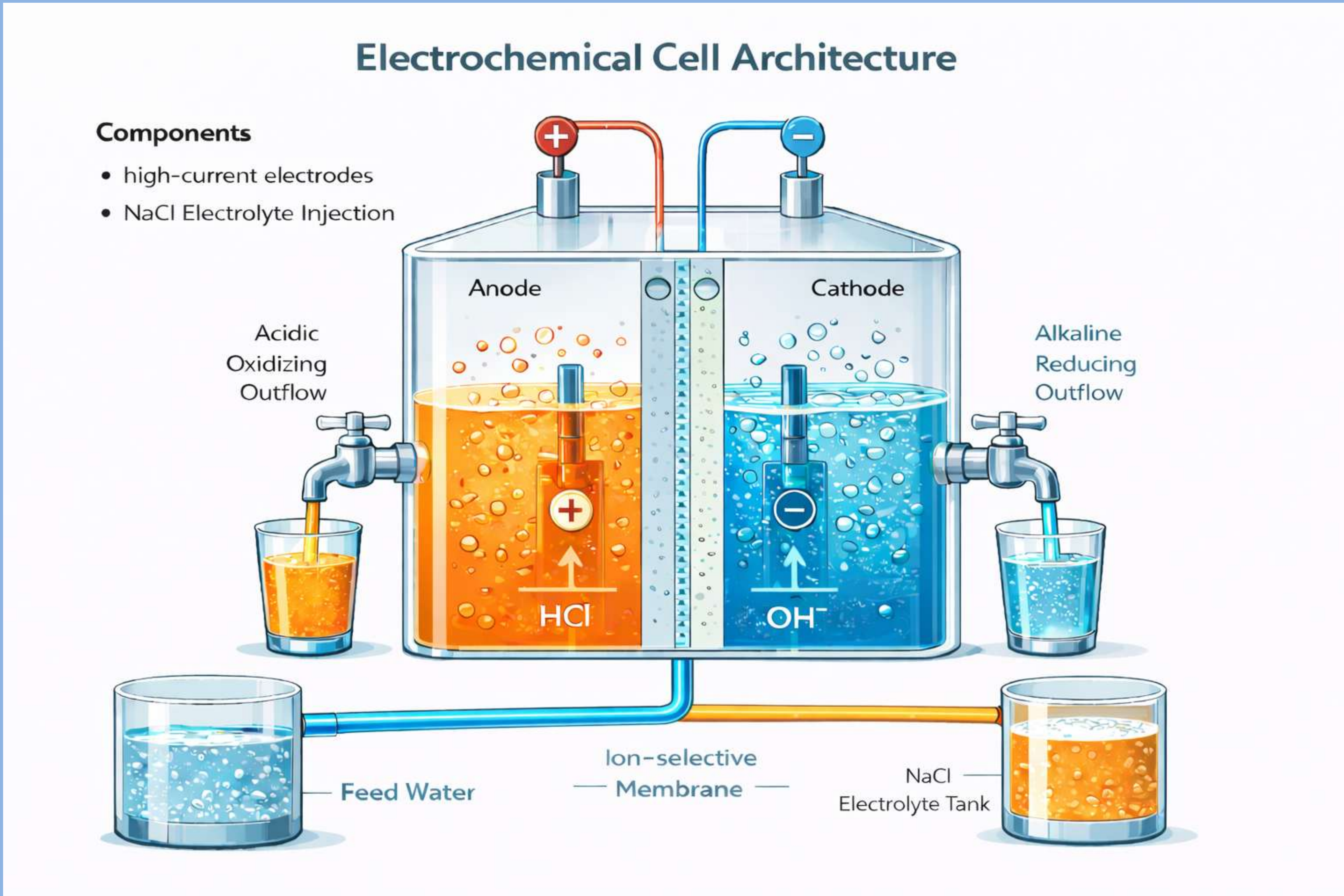


Slide 7 — Cathodic Reduction resulting chemistry



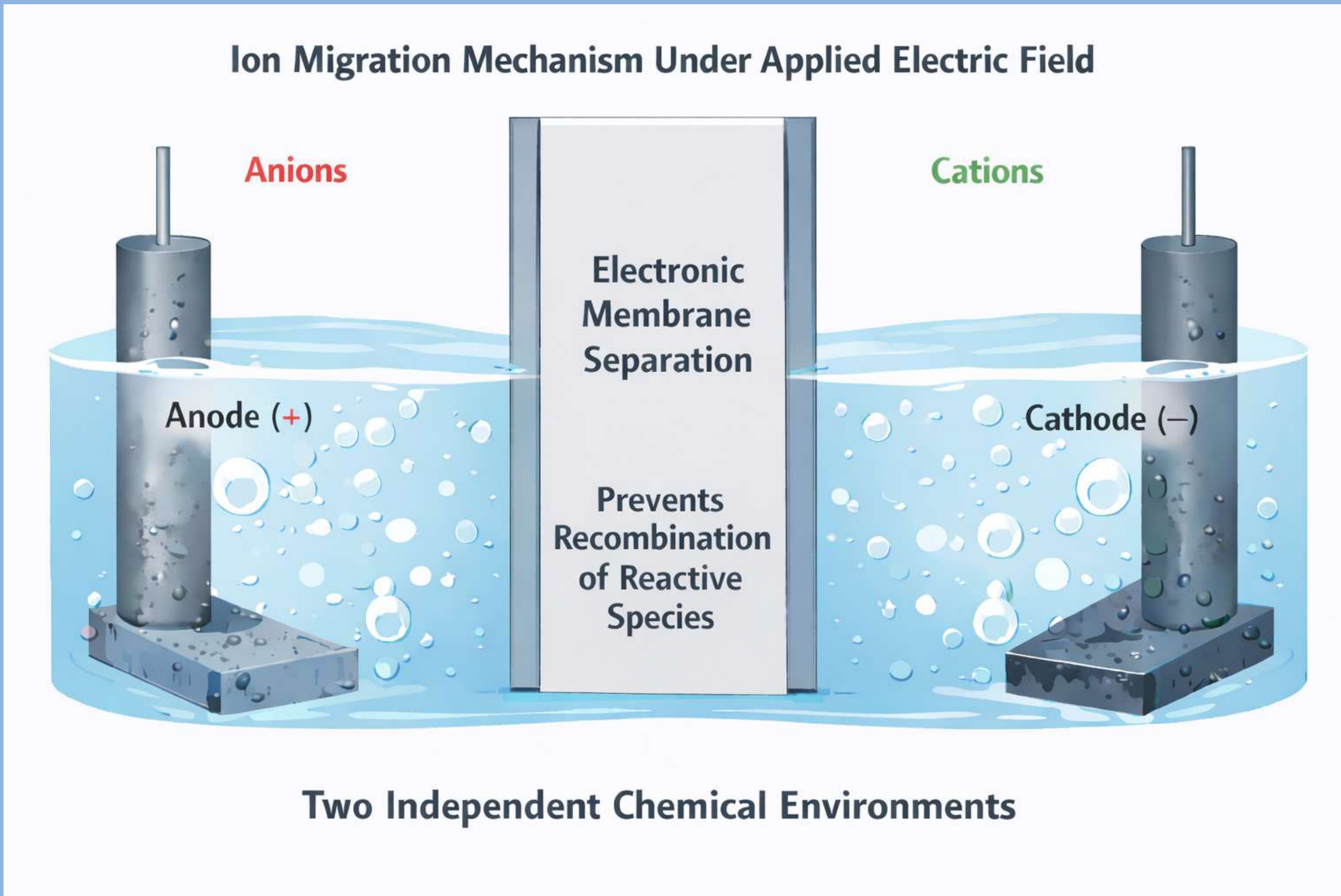
Produces alkaline conditions and hydrogen evolution, resulting in sodium hydroxide formation.

Slide 8 Electrochemical Cell Architecture Components:



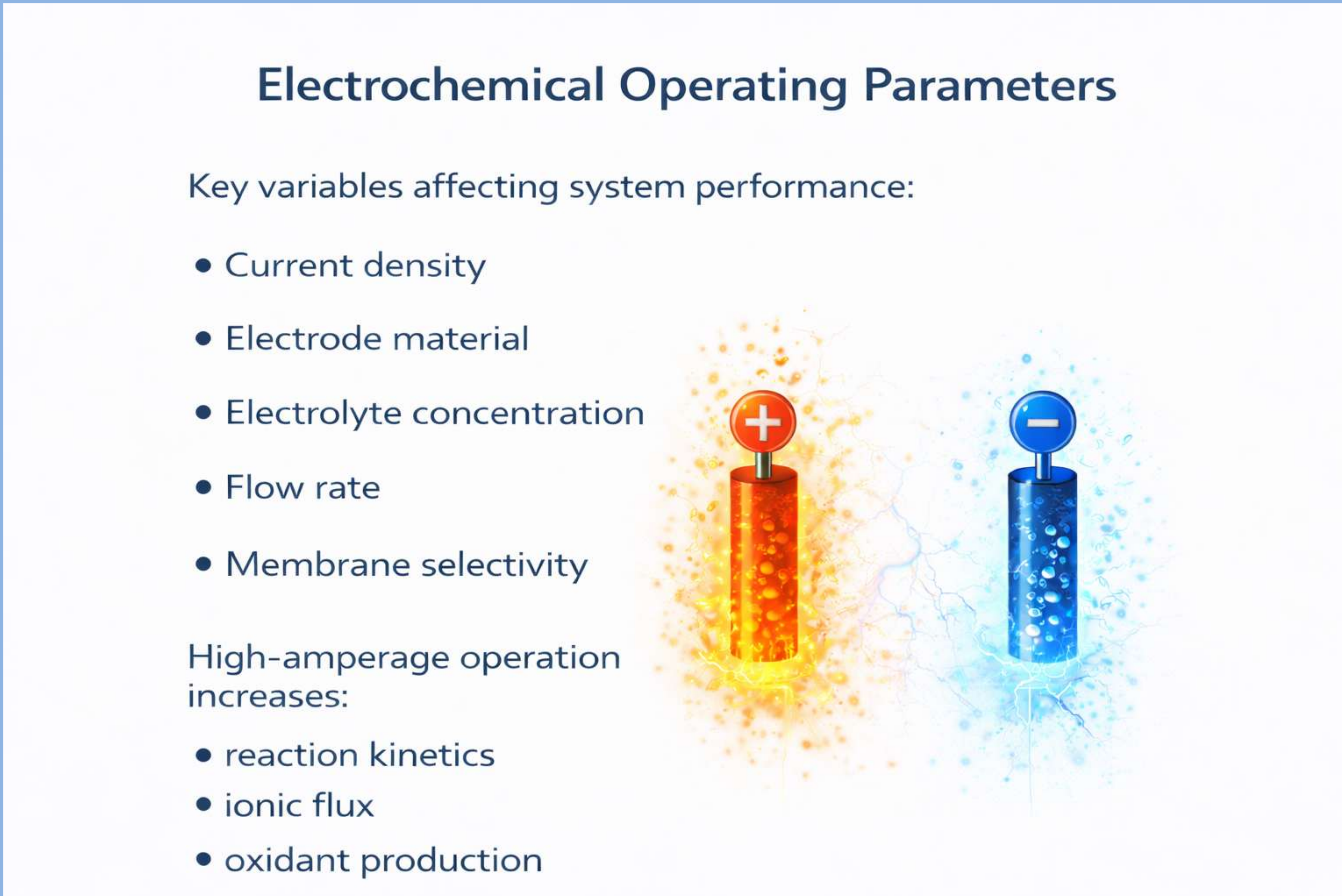
This architecture enables spatial separation of oxidation and reduction chemistry.

Slide 9 — Ion Migration Mechanism

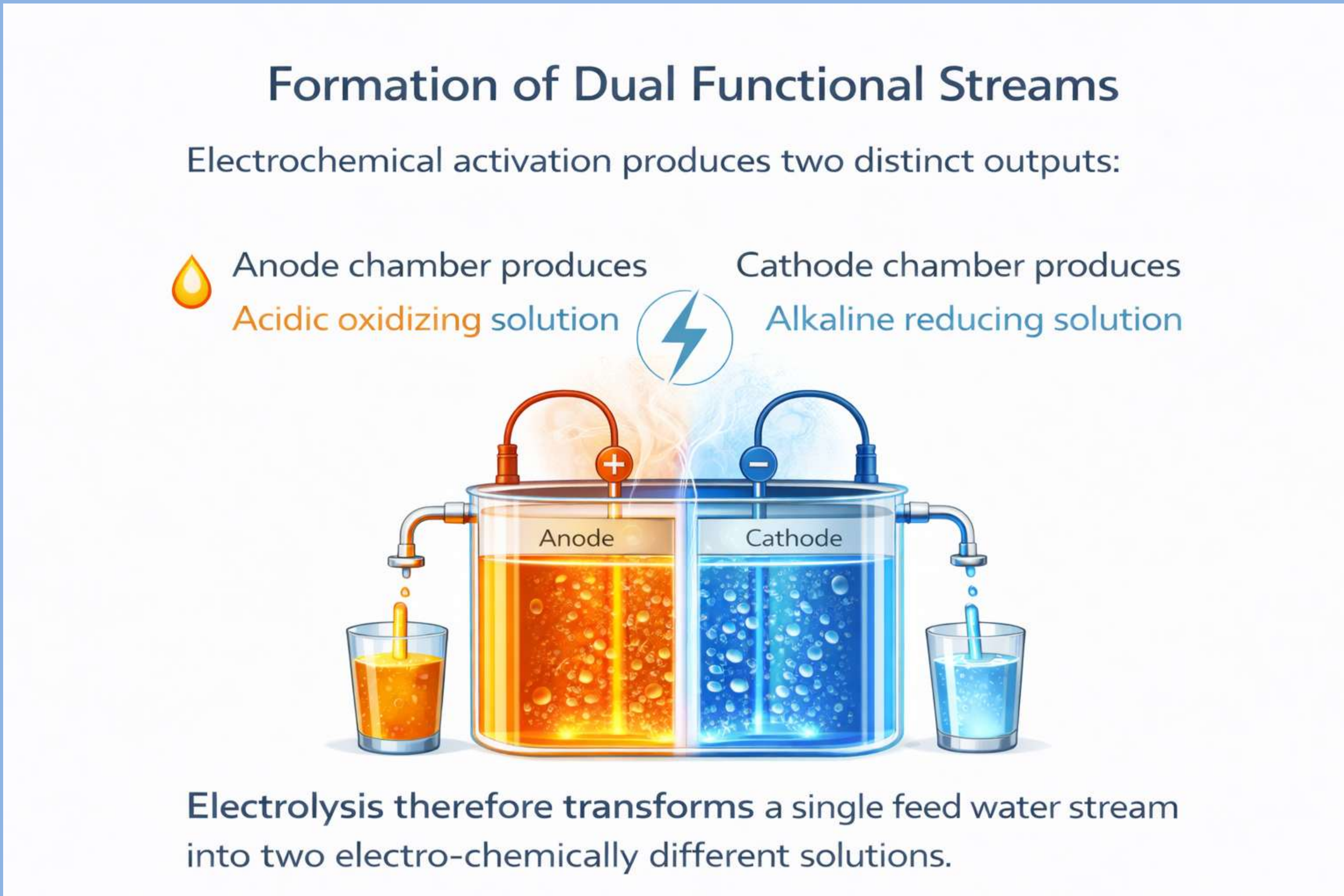


Under applied electric field: Cations → migrate toward the cathode - Anions → migrate toward the anode

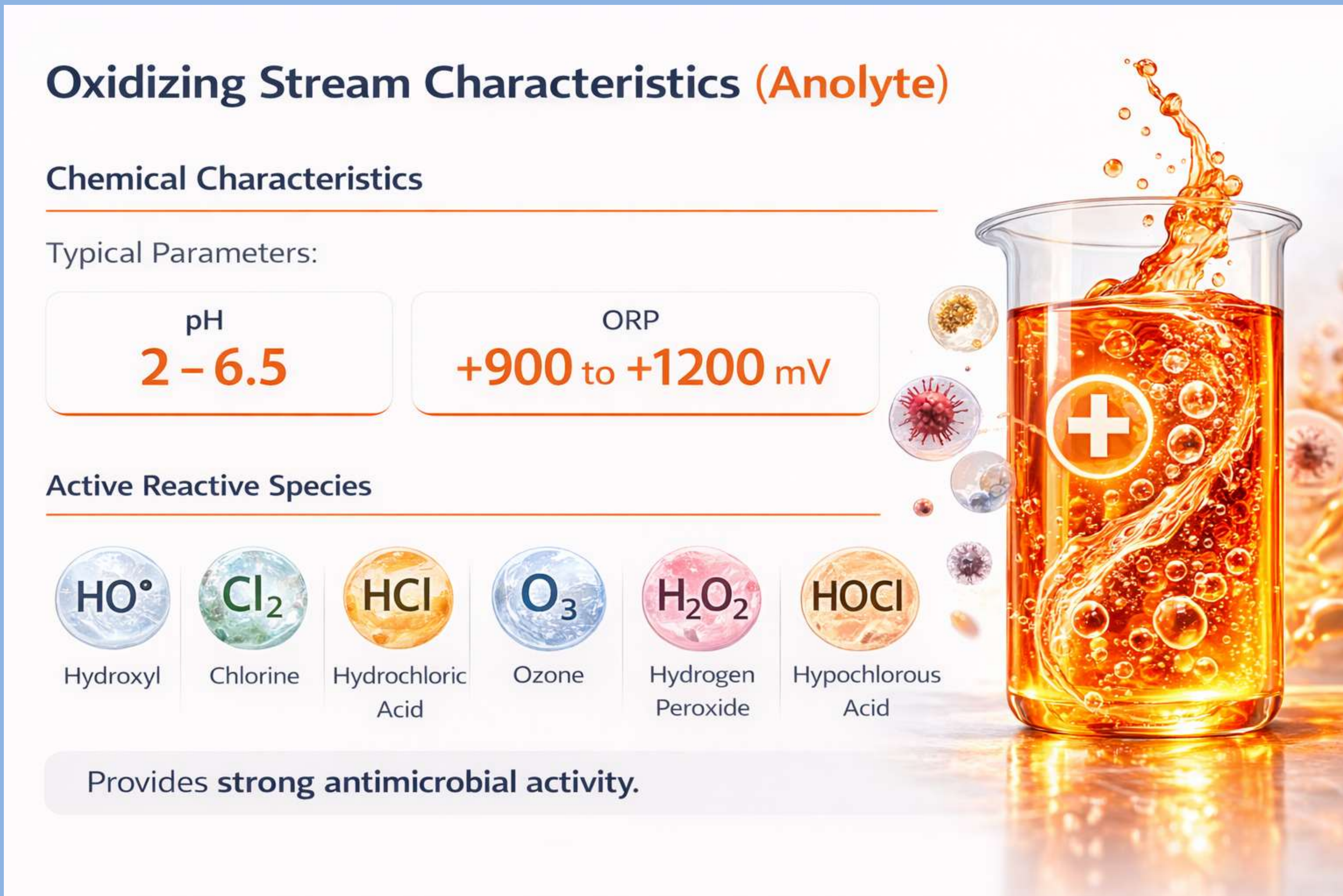
Slide 10 — Electrochemical Operating Parameters



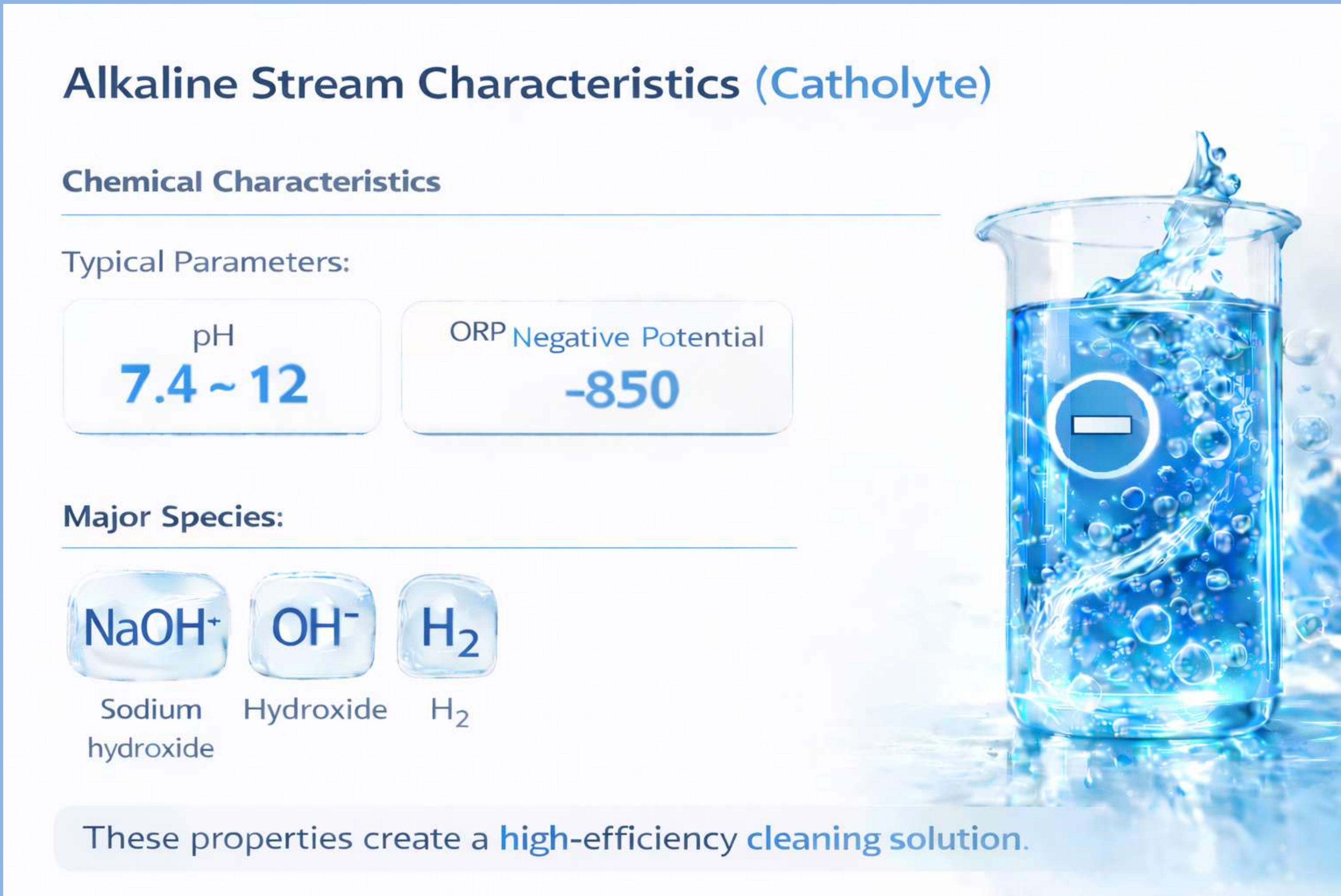
Slide 11 — Formation of Dual Functional Streams



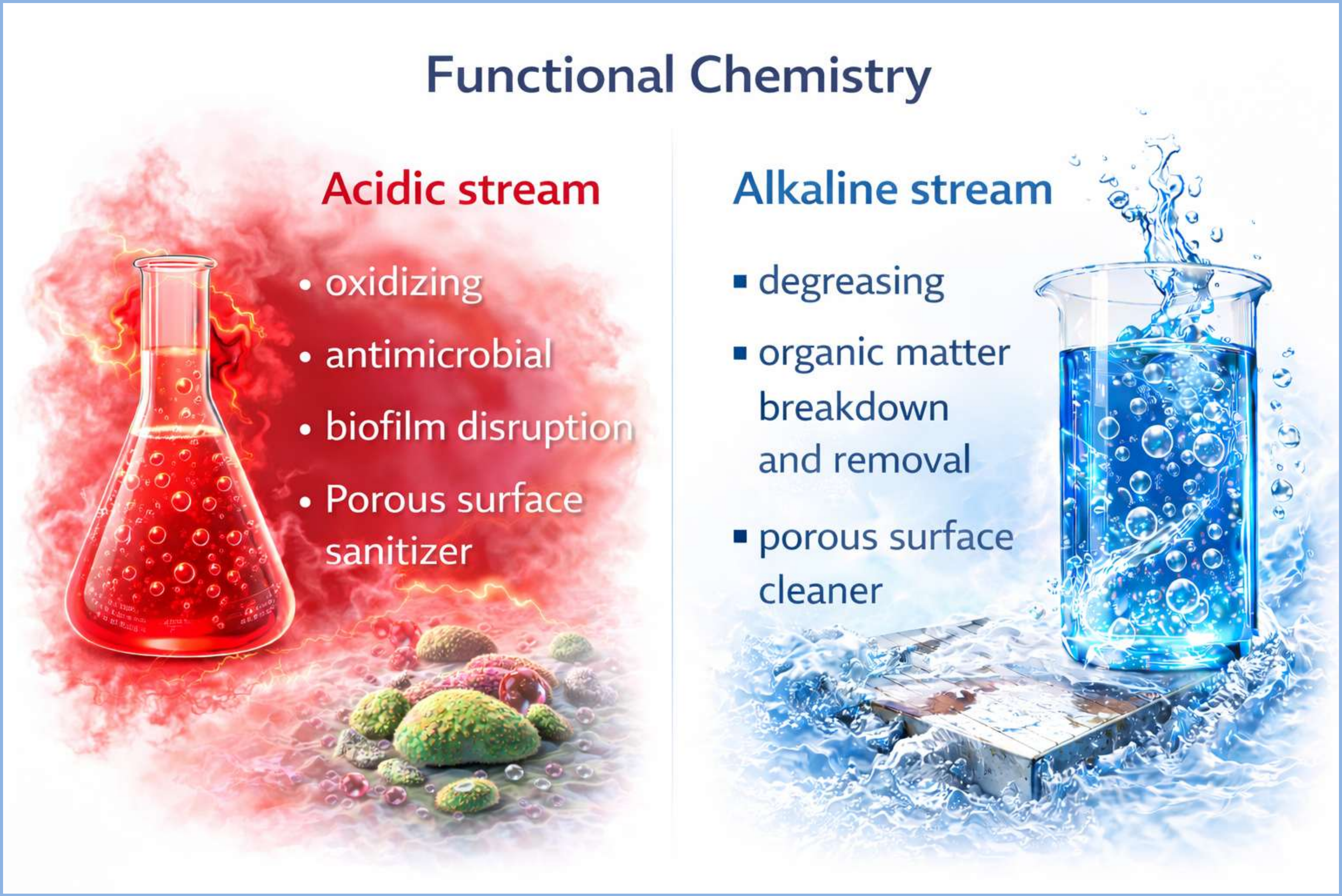
Slide 12 — Oxidizing Stream Characteristics (Anolyte)



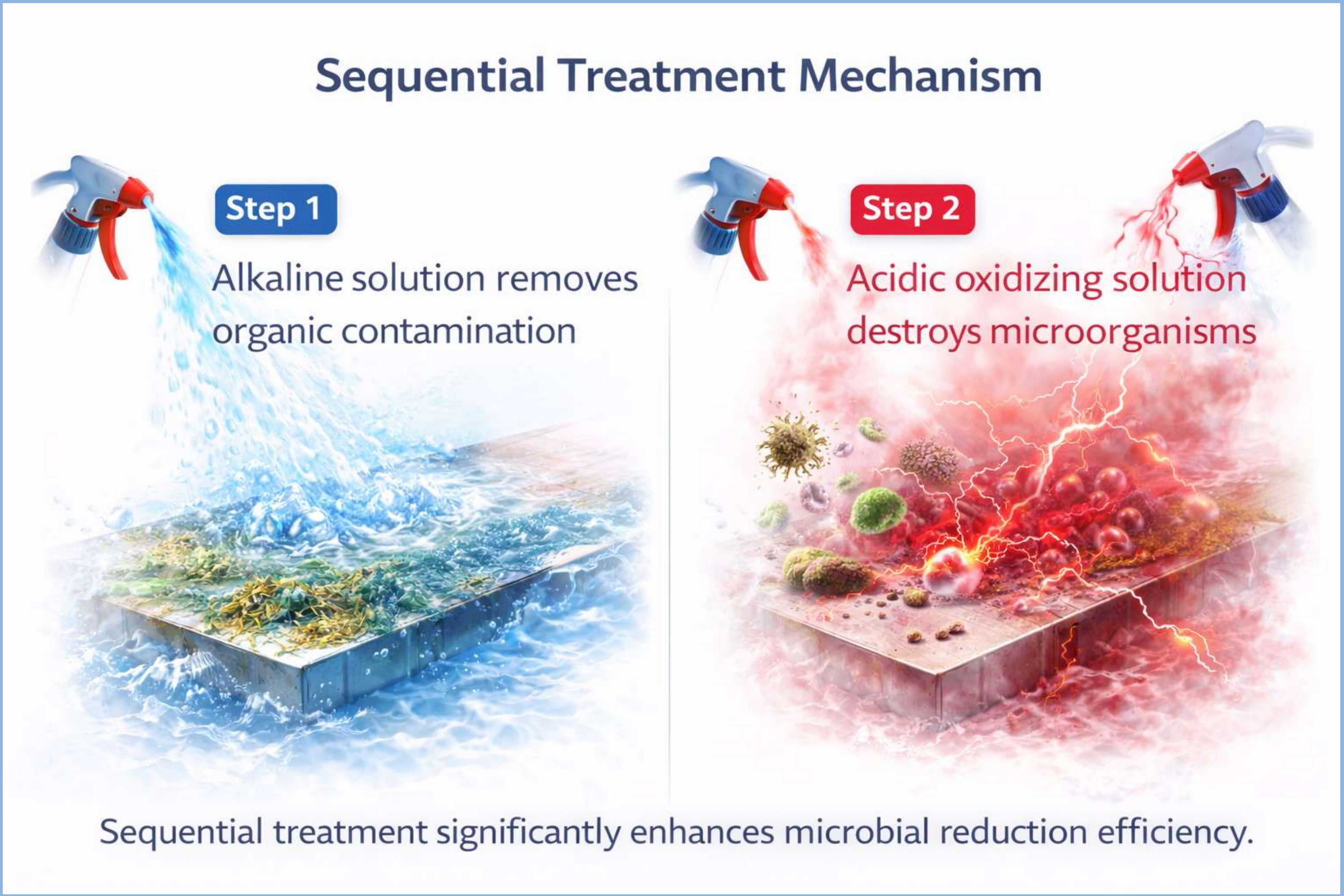
Slide 13 — Alkaline Stream Characteristics(Catholyte)



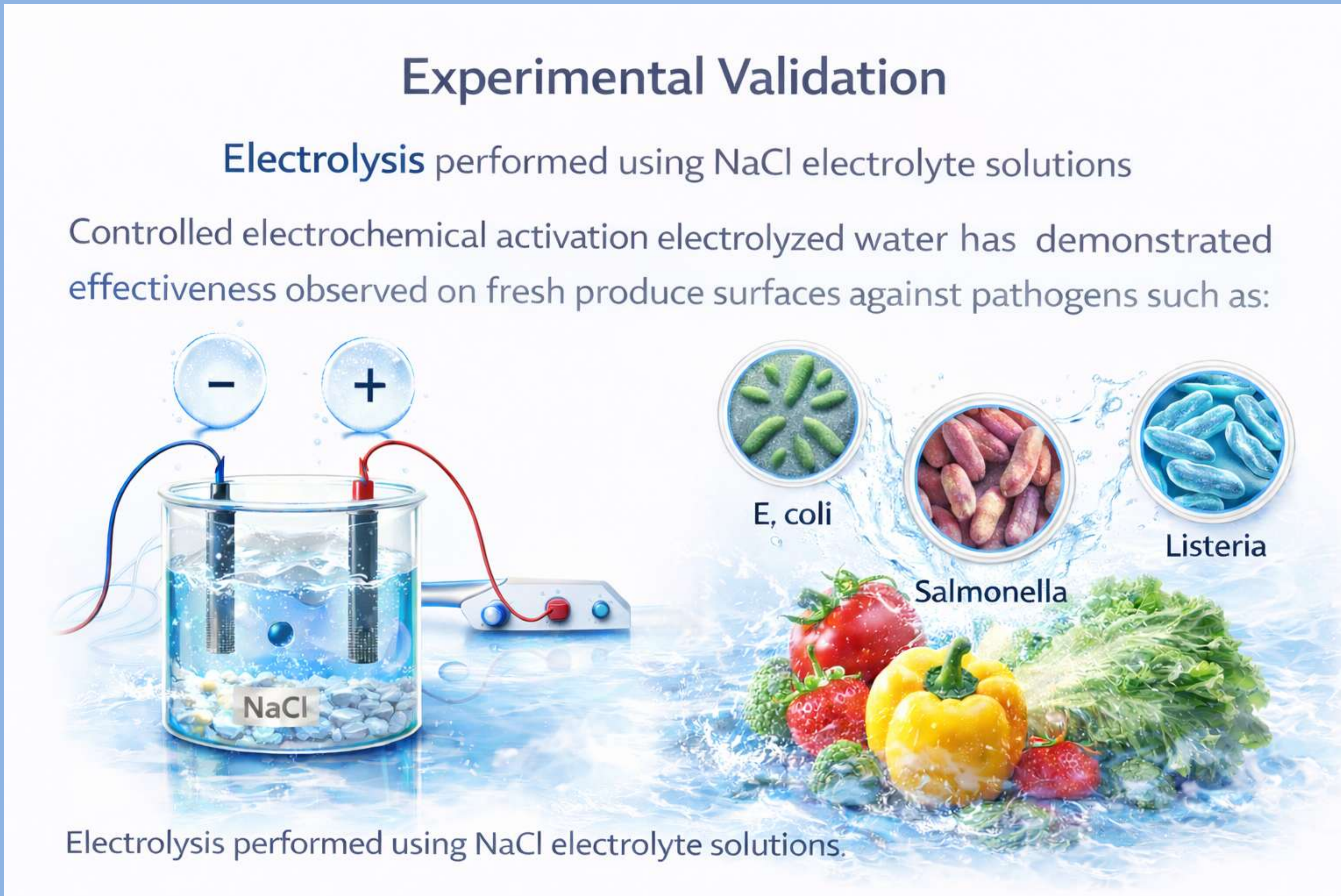
Slide 14 — Functional Chemistry



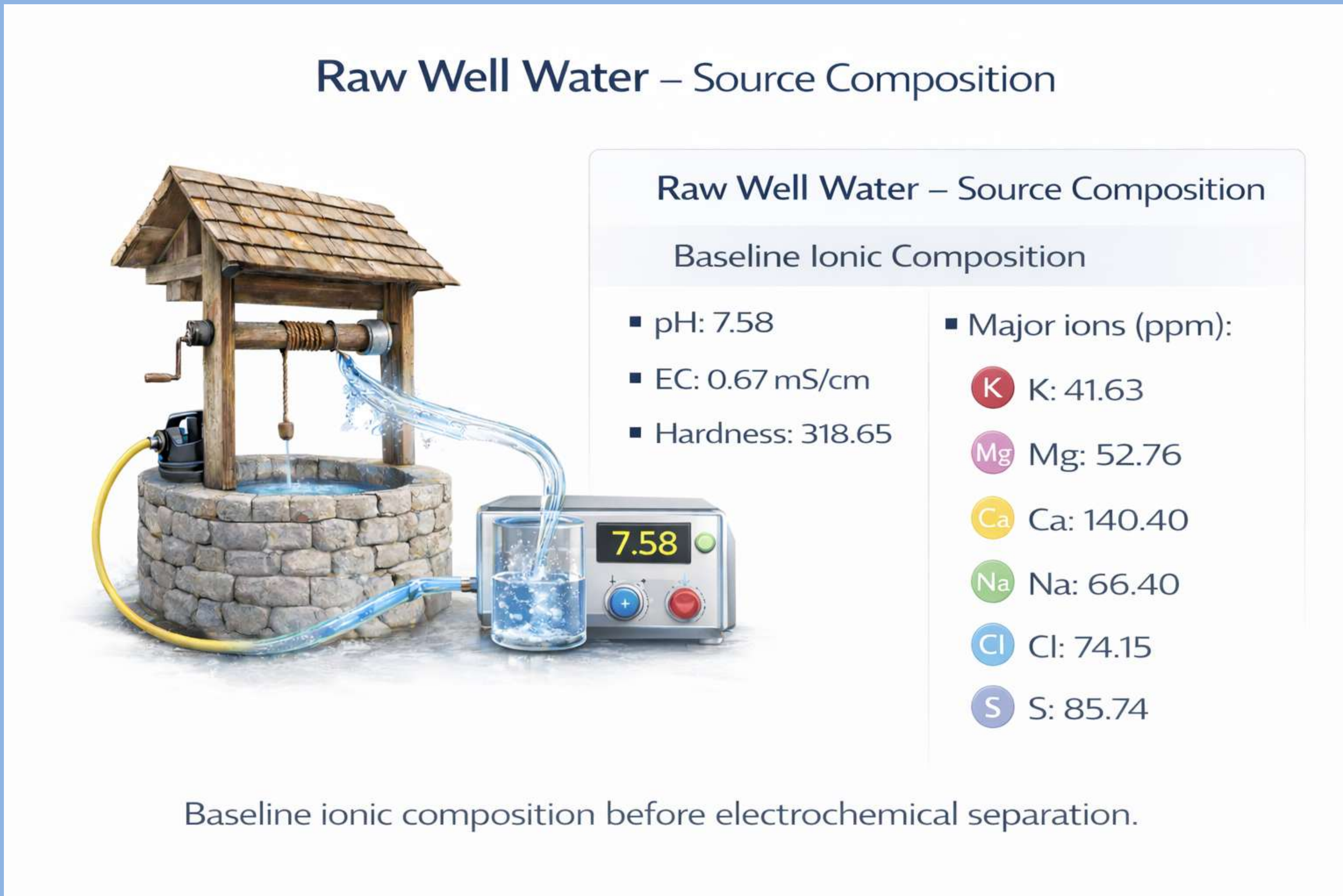
Slide 15 — Sequential Treatment **Mechanism**



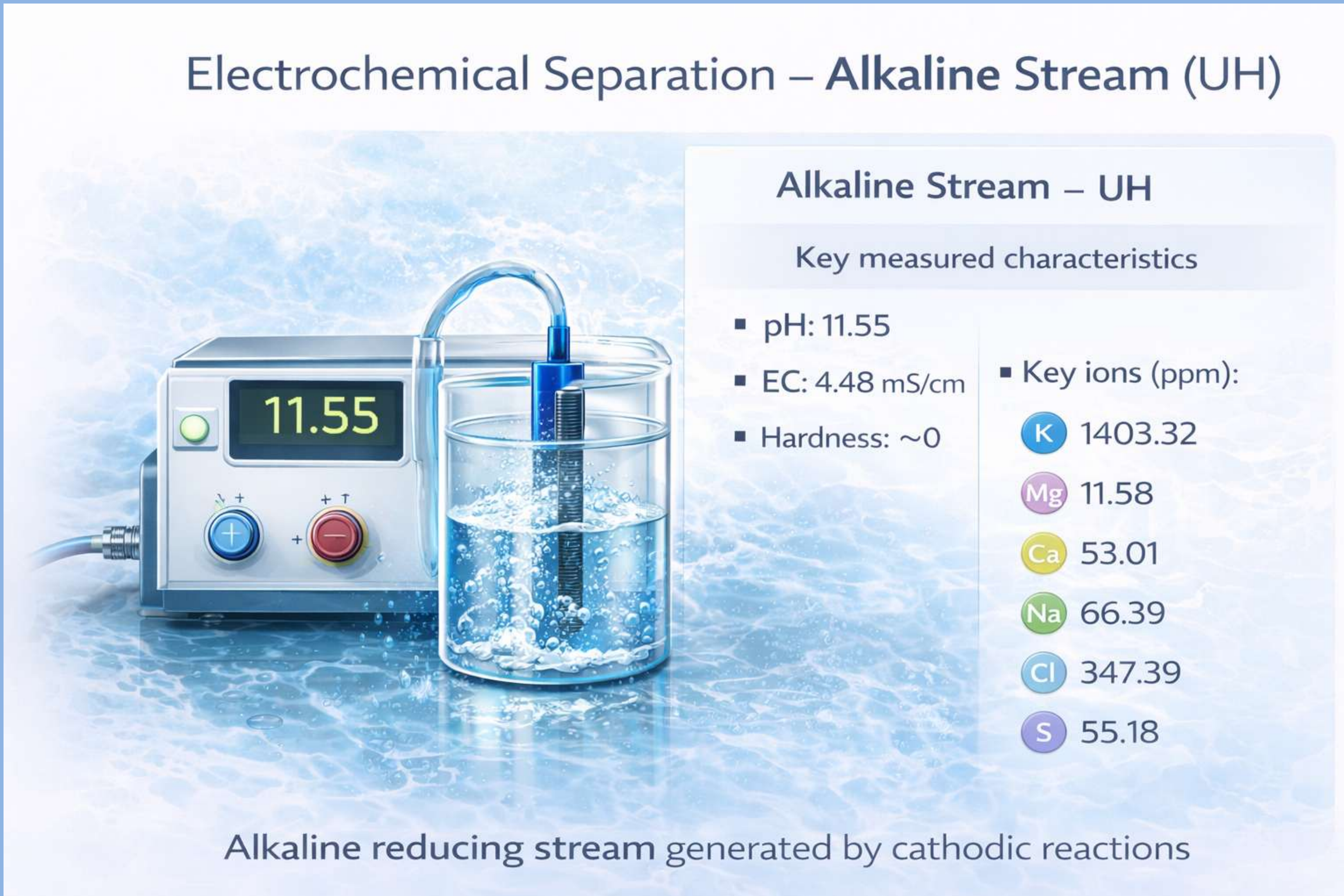
Slide 16 — Experimental Validation



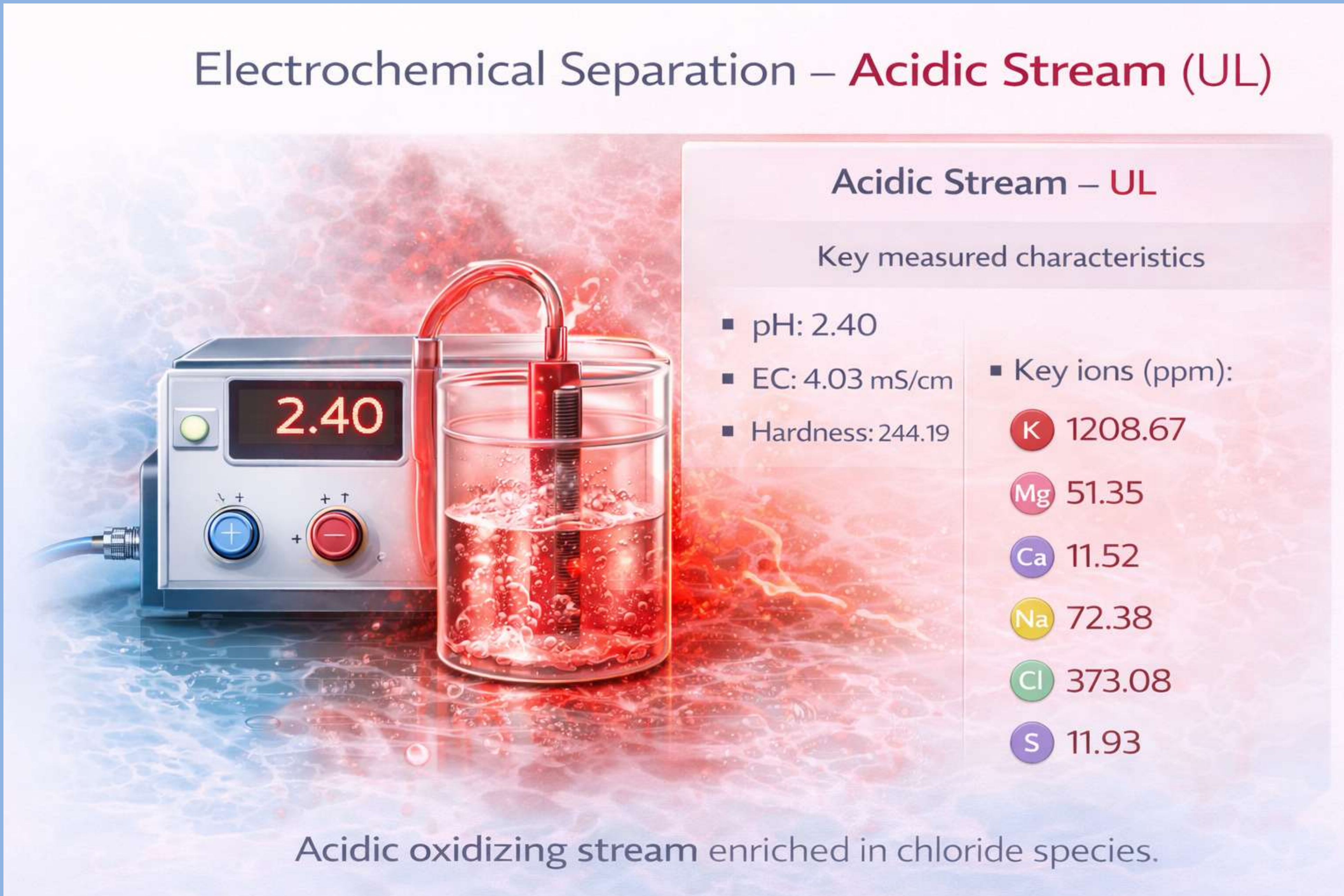
Slide 17 — Raw Well Water (Control) – Arcadia Florida



Slide 18 — Alkaline Fraction (UH Stream)



Slide 19 — Acidic Fraction (UL Stream)



Slide 20 — Electrochemical Output

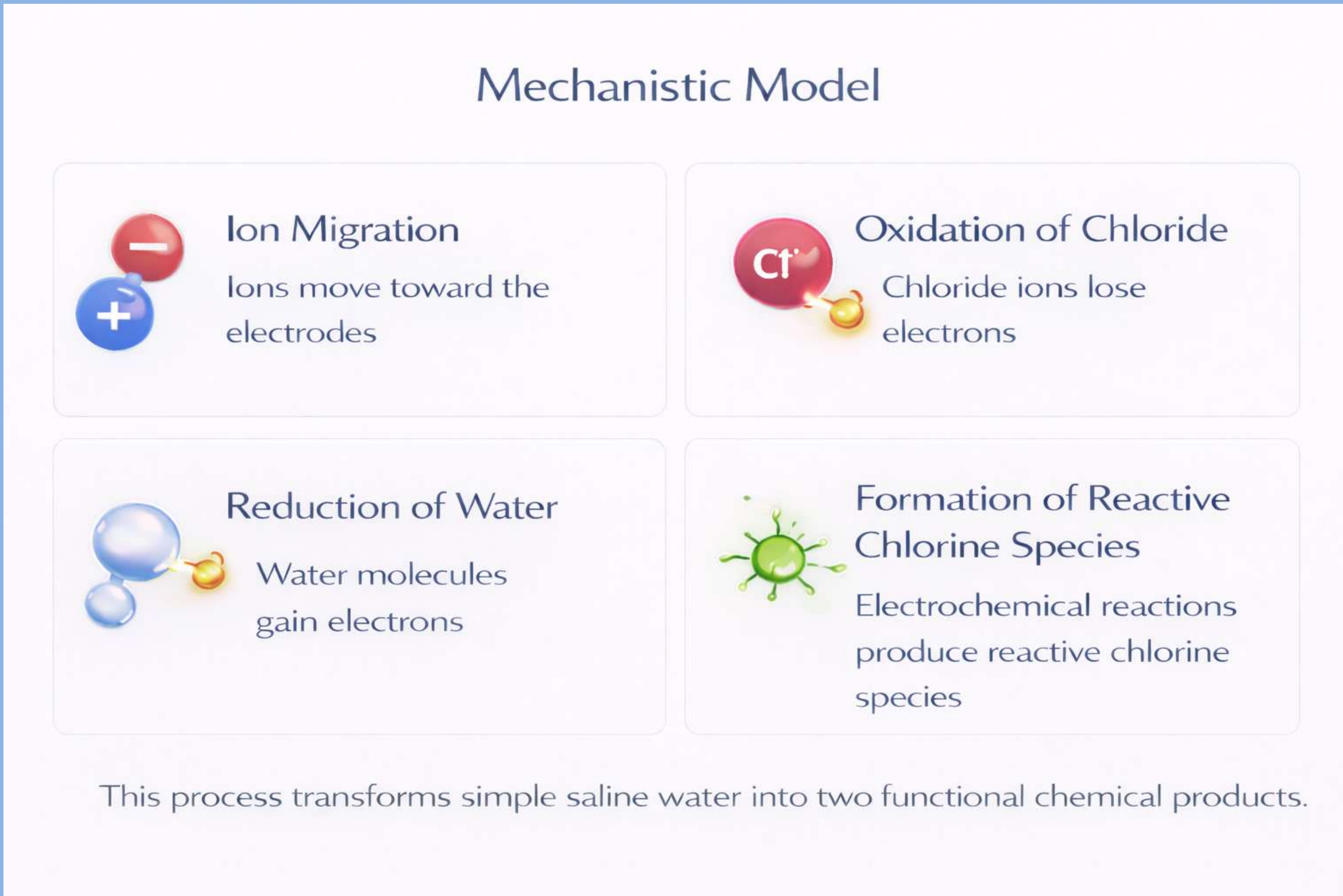
Comparison of Water Streams Before and After Electrochemical Separation

Parameter	Raw Well Water	Alkaline Stream (UH)	Acidic Stream (UL)
pH	7.58	11.55	2.40
EC (mS/cm)	0.67	4.48	4.03
Hardness	318.65	0.00	244.19
K	41.63	1403.32	1208.67
Mg	52.76	11.58	51.35
Ca	140.40	53.01	111.52
Na	66.40	66.39	72.38
Cl	74.15	347.39	373.08
S	85.74	55.18	111.93

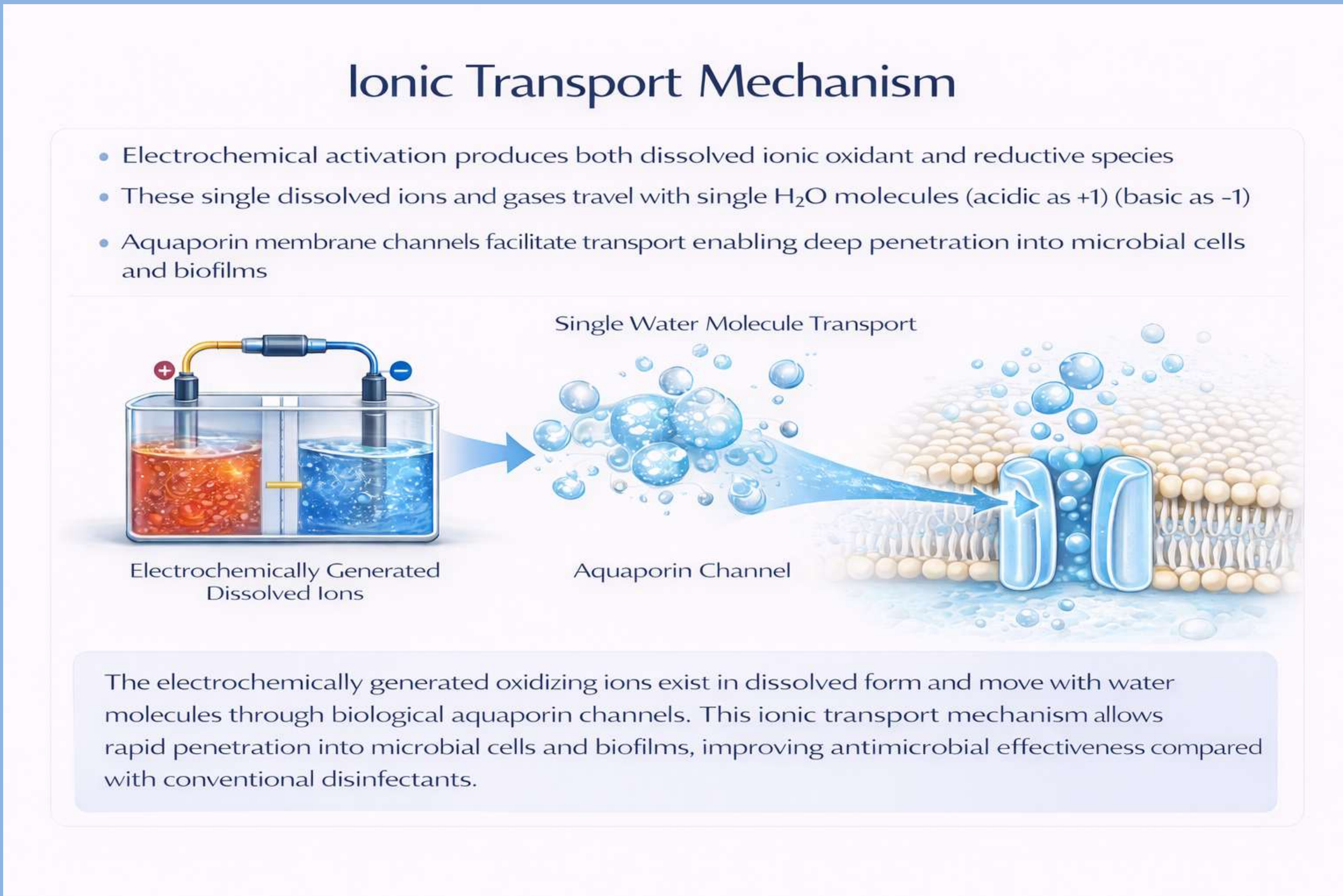
Comparative ionic composition of water streams before and after electrochemical separation.

Measured alkaline stream pH 11.55 ~ Measured acidic stream pH 2.40
This confirms effective electrochemical ion separation.

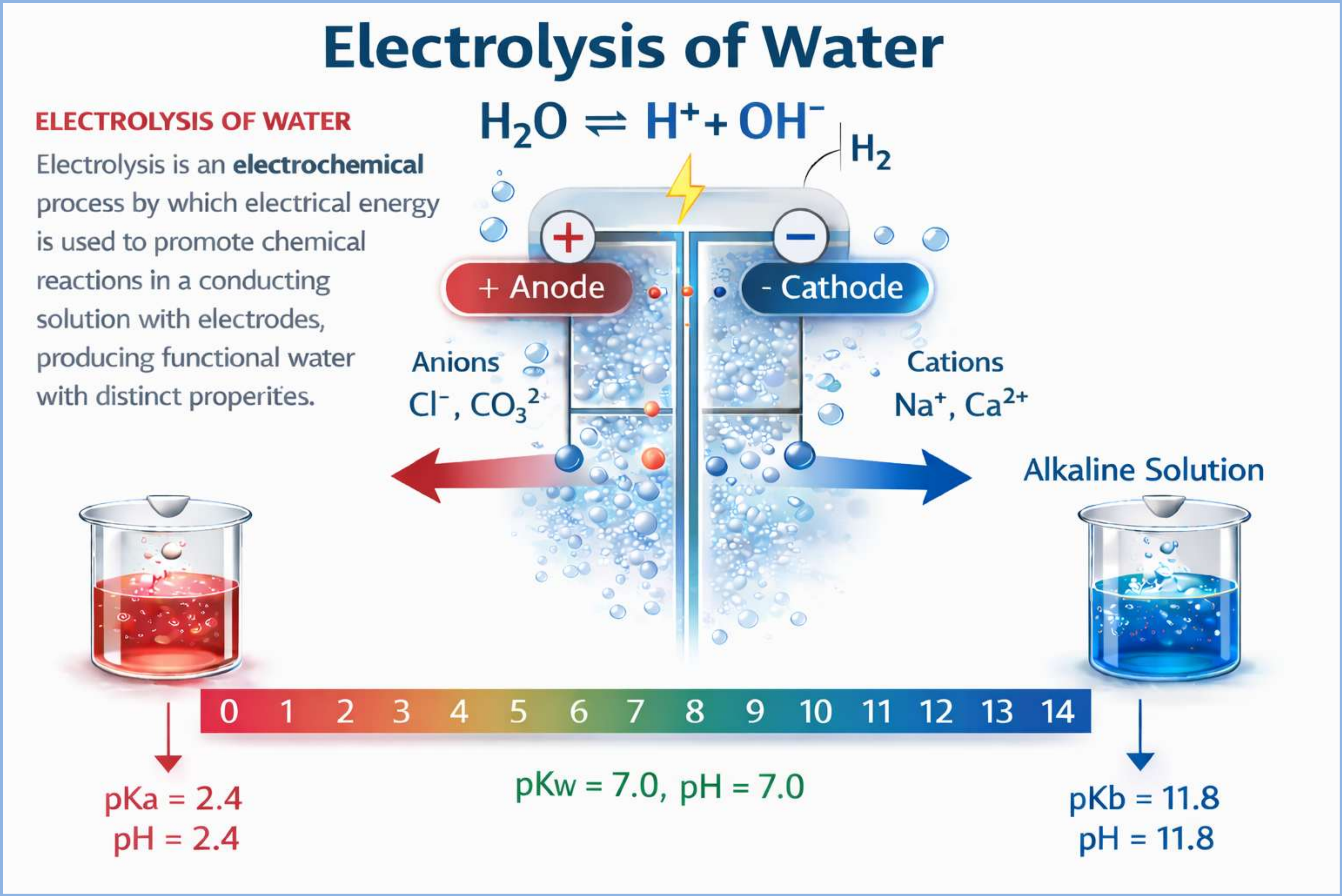
Slide 21 — Mechanistic Model



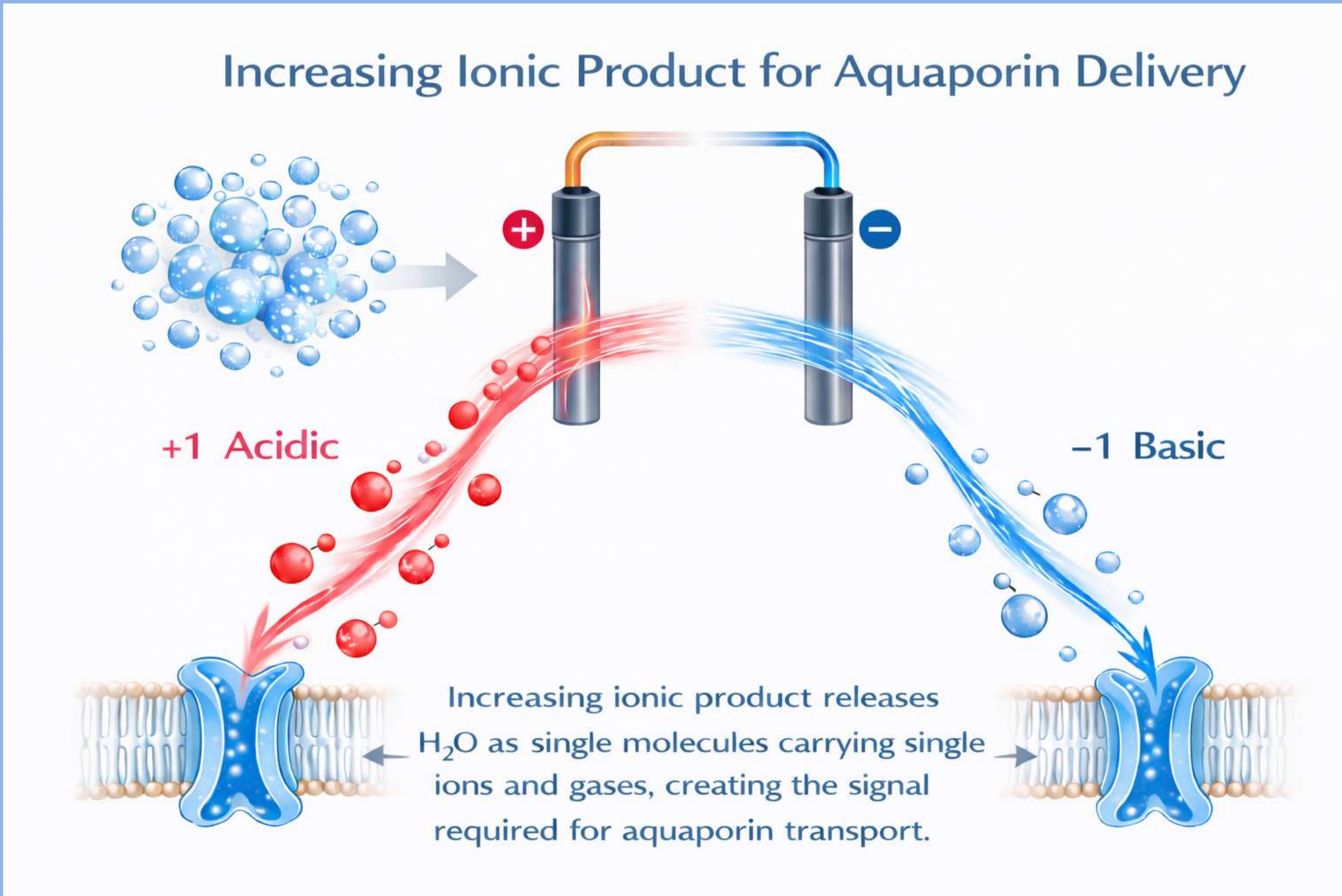
Slide — The Ionic Transport Mechanism



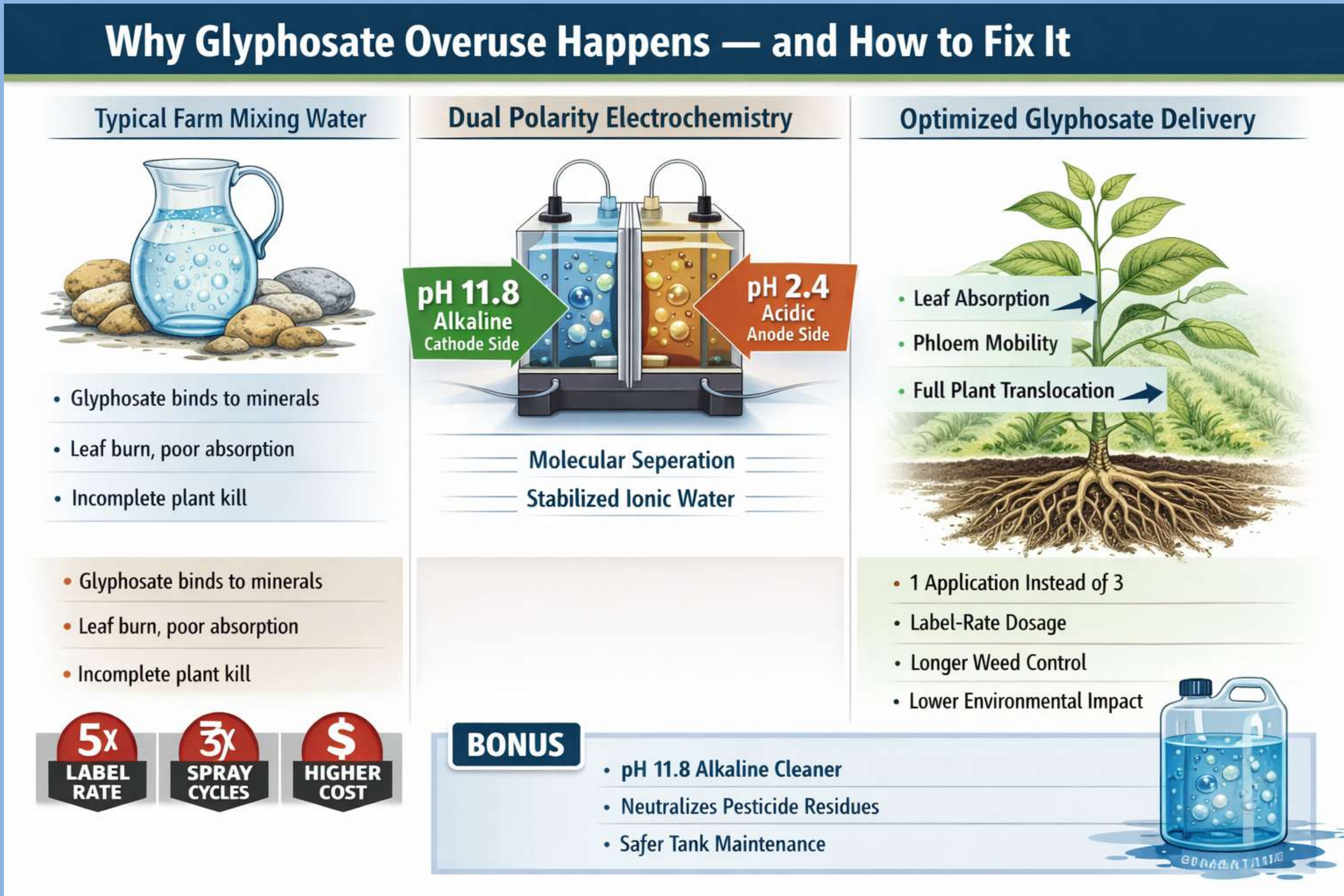
Slide 23 — The Electrolysis of Water



Slide 24 — Increase Ionic Product, maximize delivery potential



Slide 25 — Advantages for AG Pesticide Products – Acidic Isolation with 6.45 Ionic Product – Optimize delivery

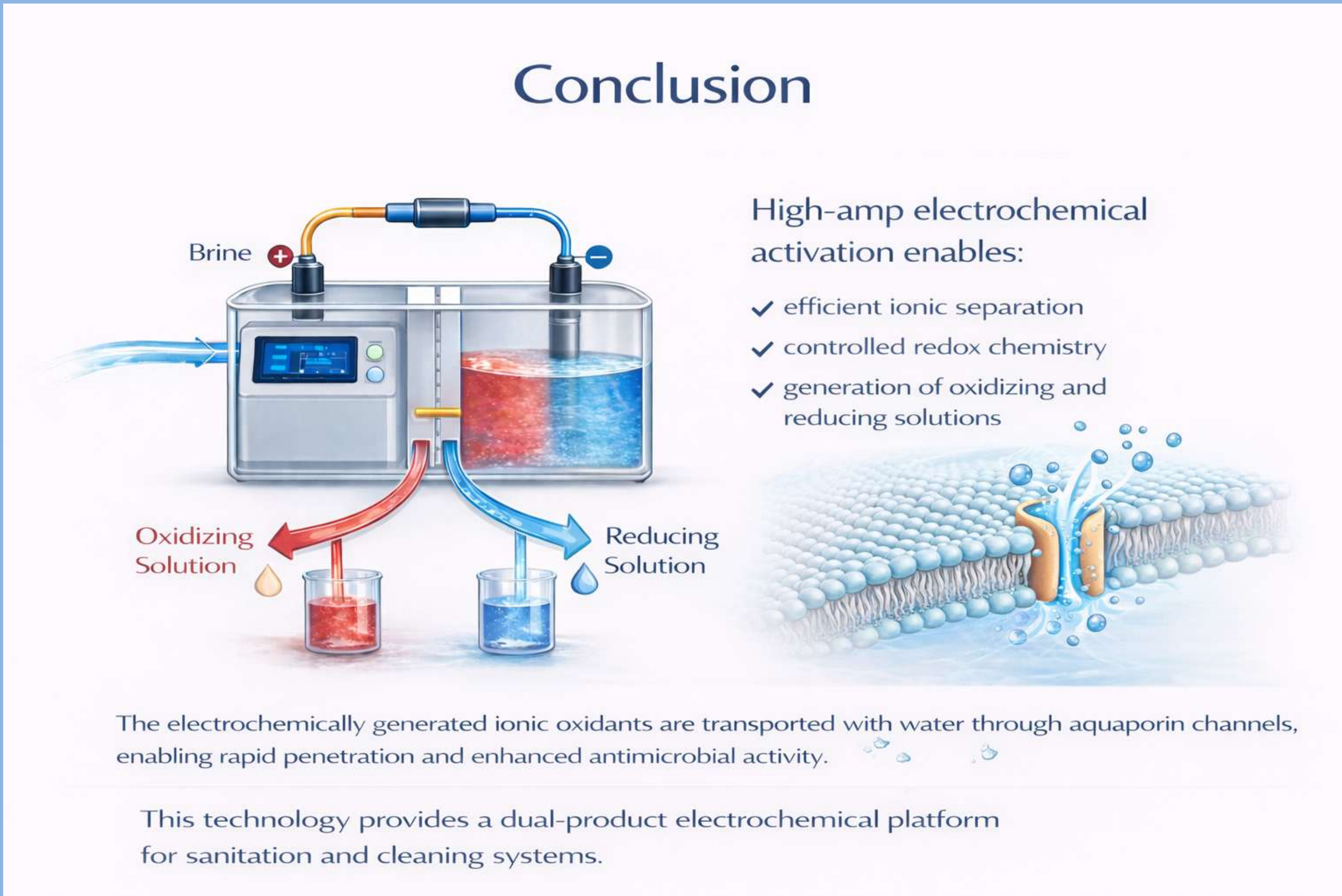


Example of a well known and worldwide used product. Change the medium for mixing, change the game

Slide 26 — System Advantages

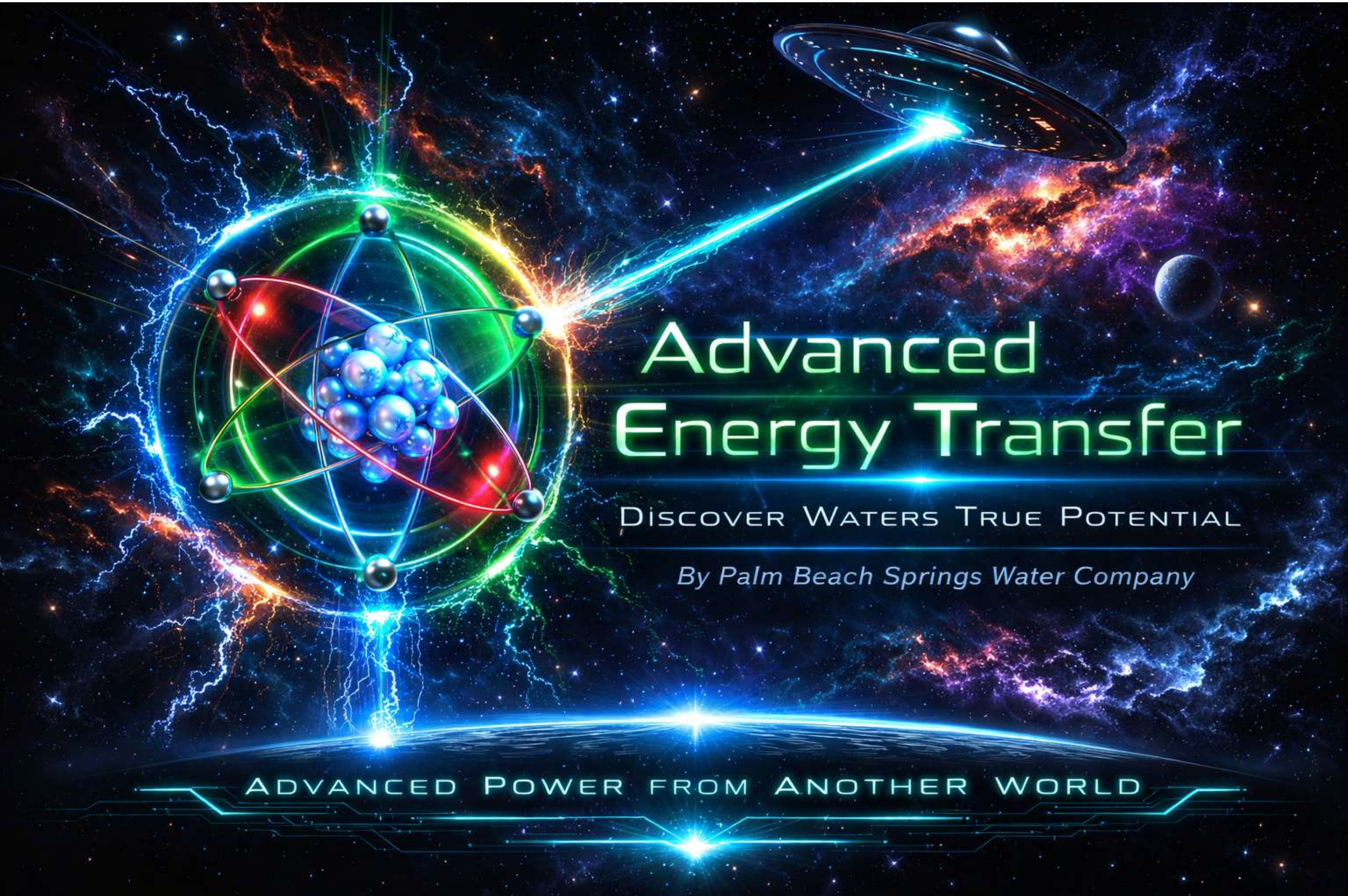
Slide 27 — Application Areas

Slide 28 — Conclusion



Slide 29 — Continuing Optimization Advancements

This PP is by: Paul E. Seaver PBSWC Inc. with a little help from AI, thanks for checking it out



Membrane Separation with Electrolyte Injection is 1 of the many systems available through AET