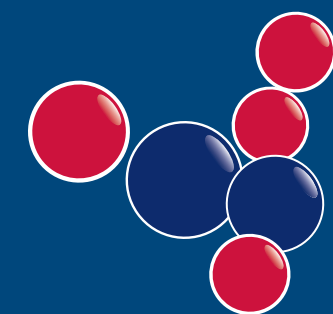


pH Effects of Chloride Form Anion Resins

Presented to Eastern Water Quality Association

Bill Koebel, May 2014

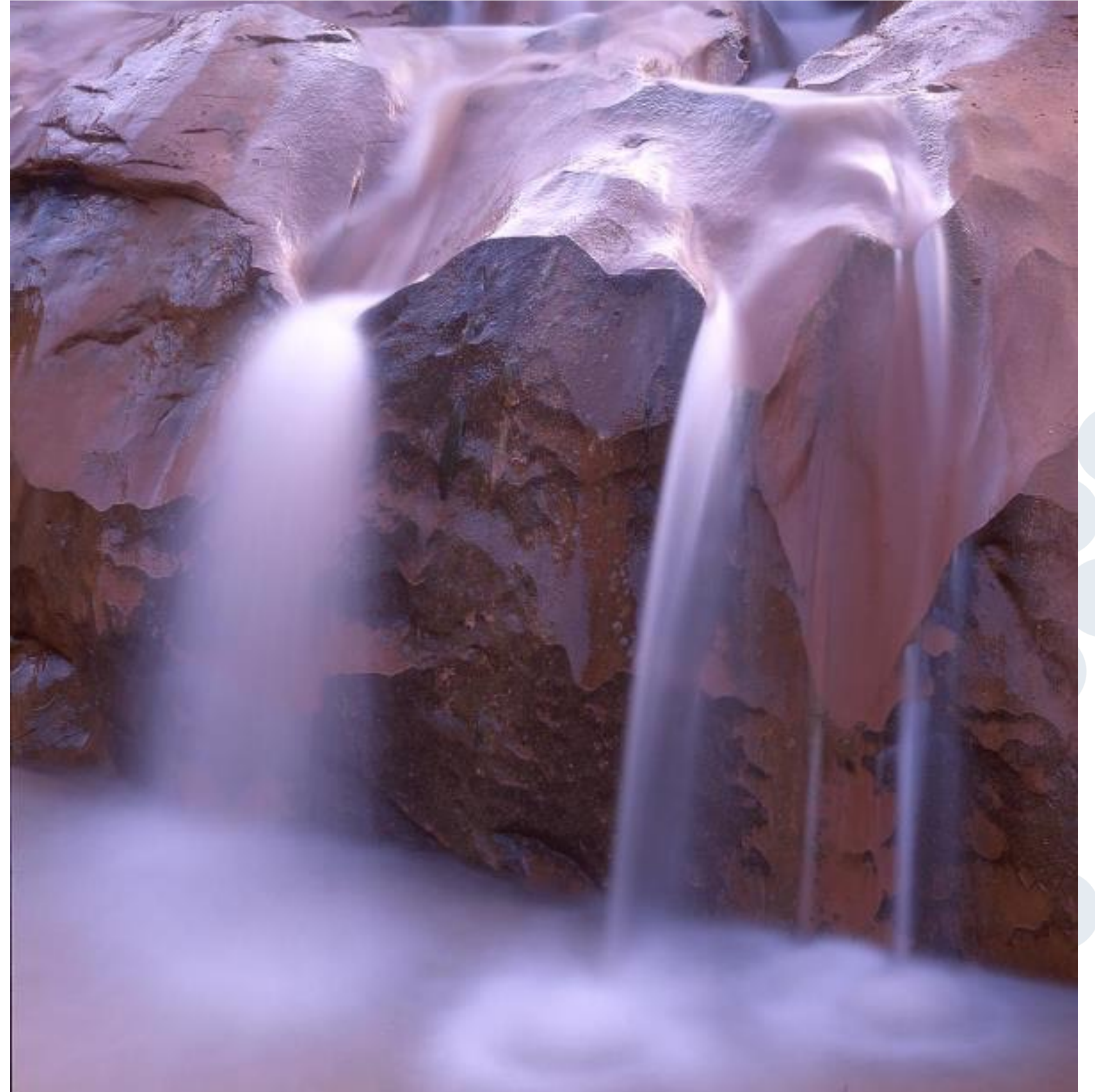


RESINTECH[®] INC.

INNOVATIONS IN ION EXCHANGE

Contaminants

- Alkalinity
- Arsenic
- Nitrate
- Sulfate
- Tannins
- Perchlorate
- Uranium
- Chromate

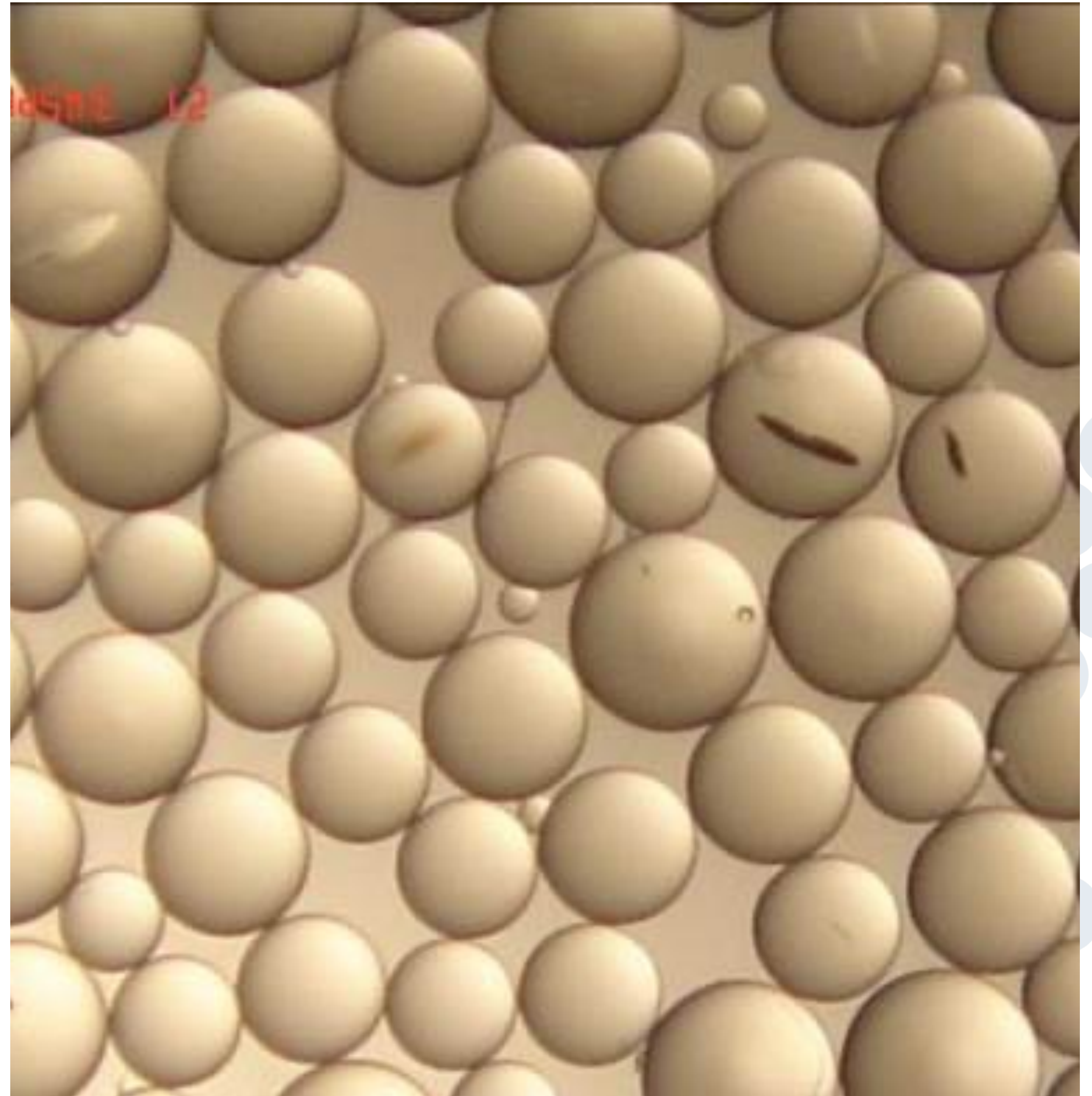


Type of Anion Resin

- Alkalinity
- Arsenic
- Nitrate
- Sulfate
- Tannins
- Perchlorate
- Uranium
- Chromium
- Standard SBA
- Standard SBA
- Selective or Standard
- Standard SBA
- Selective
- Selective
- Standard SBA
- Selective or Standard

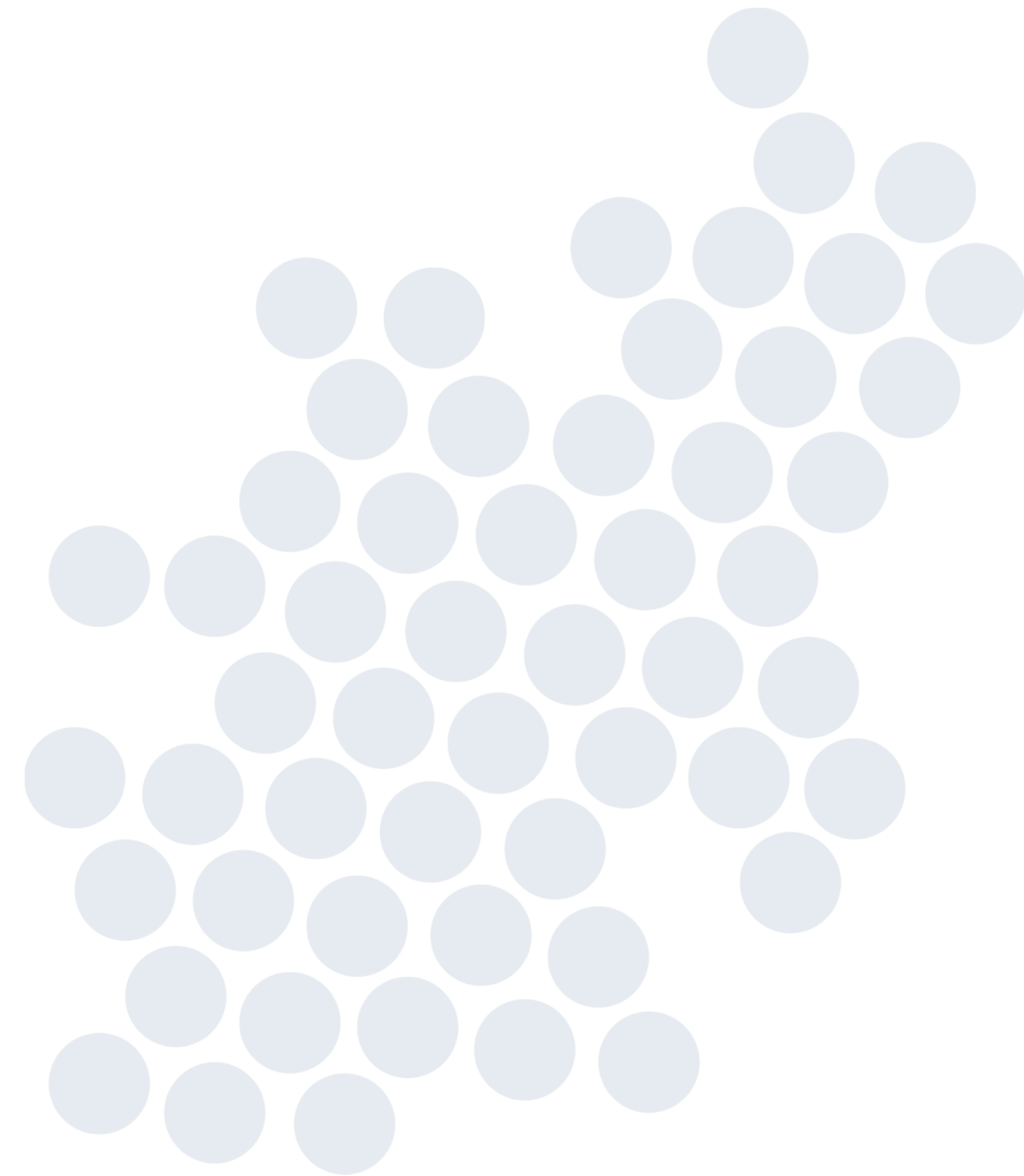
Ion Exchange Today

- Tiny plastic beads that have been chemically activated
- They are manufactured products that are made from petrochemical based monomers



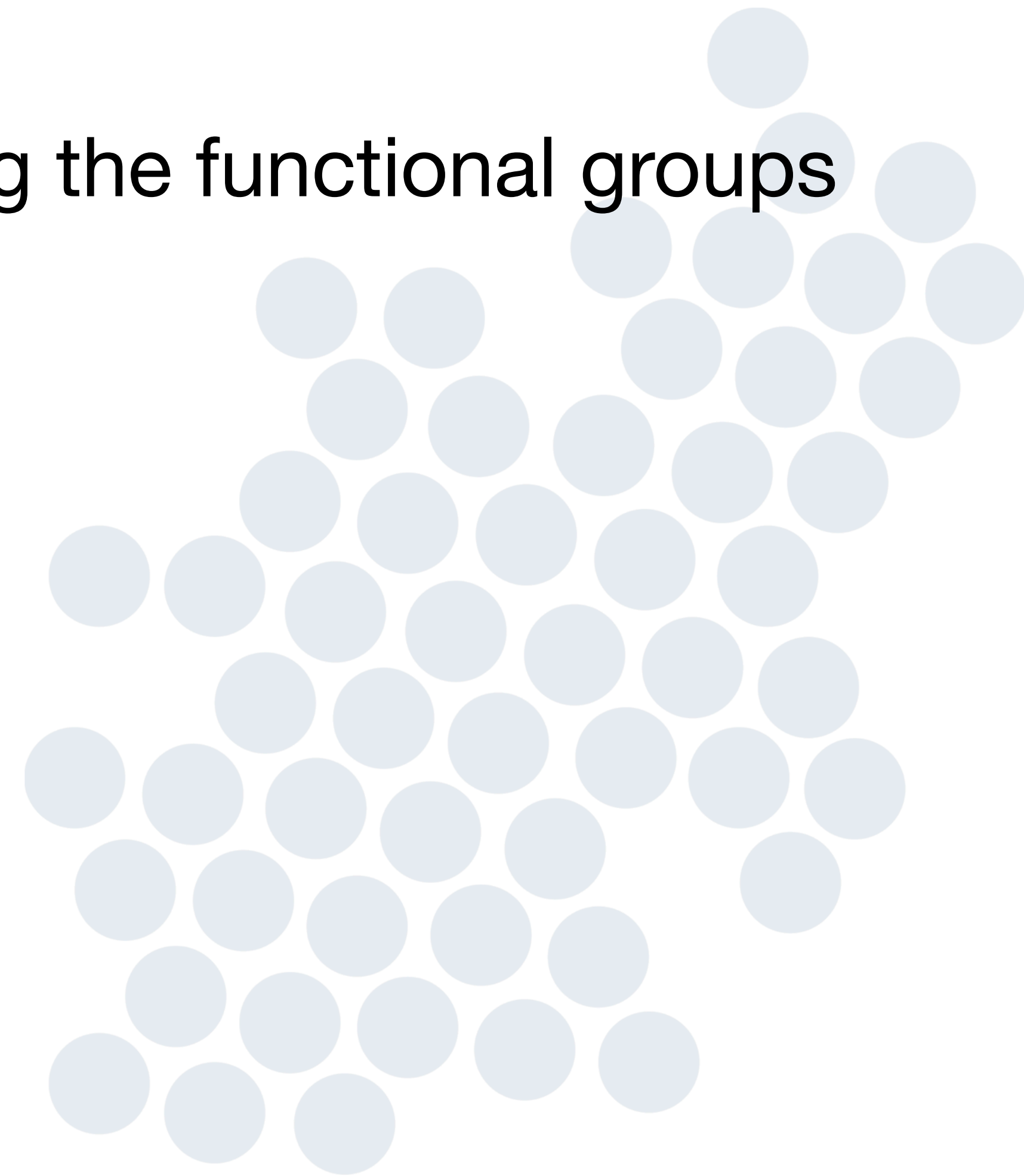
Make the Beads

- Mix Styrene with Divinyl Benzene (Crosslinkage)
- Suspension Polymerization
- No Water Content
- Neither Cation or Anion resin
- Beads are called co-polymer



Anion Resins

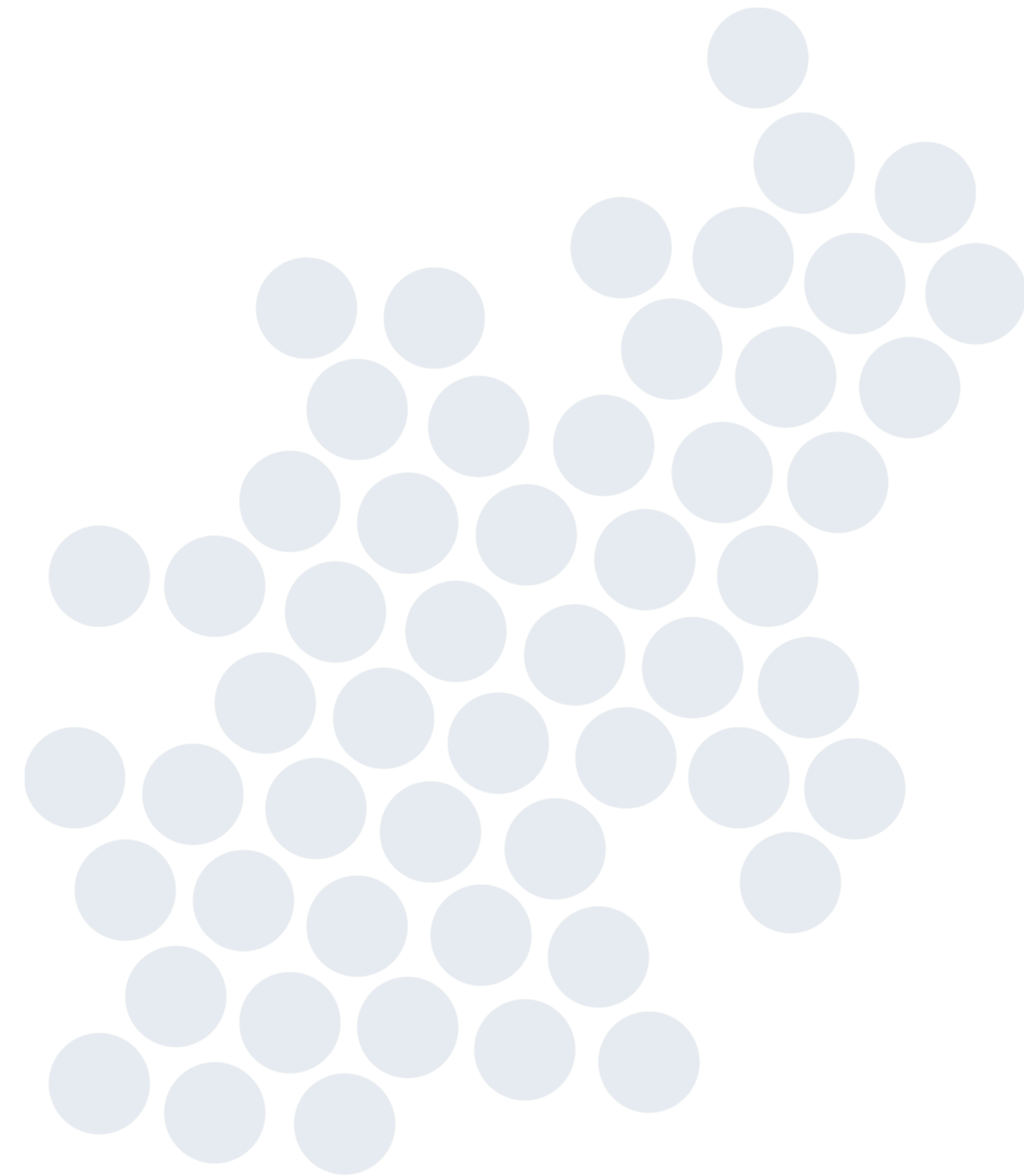
- Swell the co-polymer
- Chloromethylation – prepares the resin for adding the functional groups
- Amination – adds the amine functional groups
 - Why it smells like fish
- Properties
 - About 27,000 grains per cu. ft.
 - 55% moisture content
 - 44 pounds per cu. ft.
 - 93%+ whole beads





Material Properties

- Size between 16 to 50 U.S. Mesh
- Resistance to fracture
- Insoluble
- Permanently attached sites
- High capacity for ions
- Temperature effects negligible



Common Anions

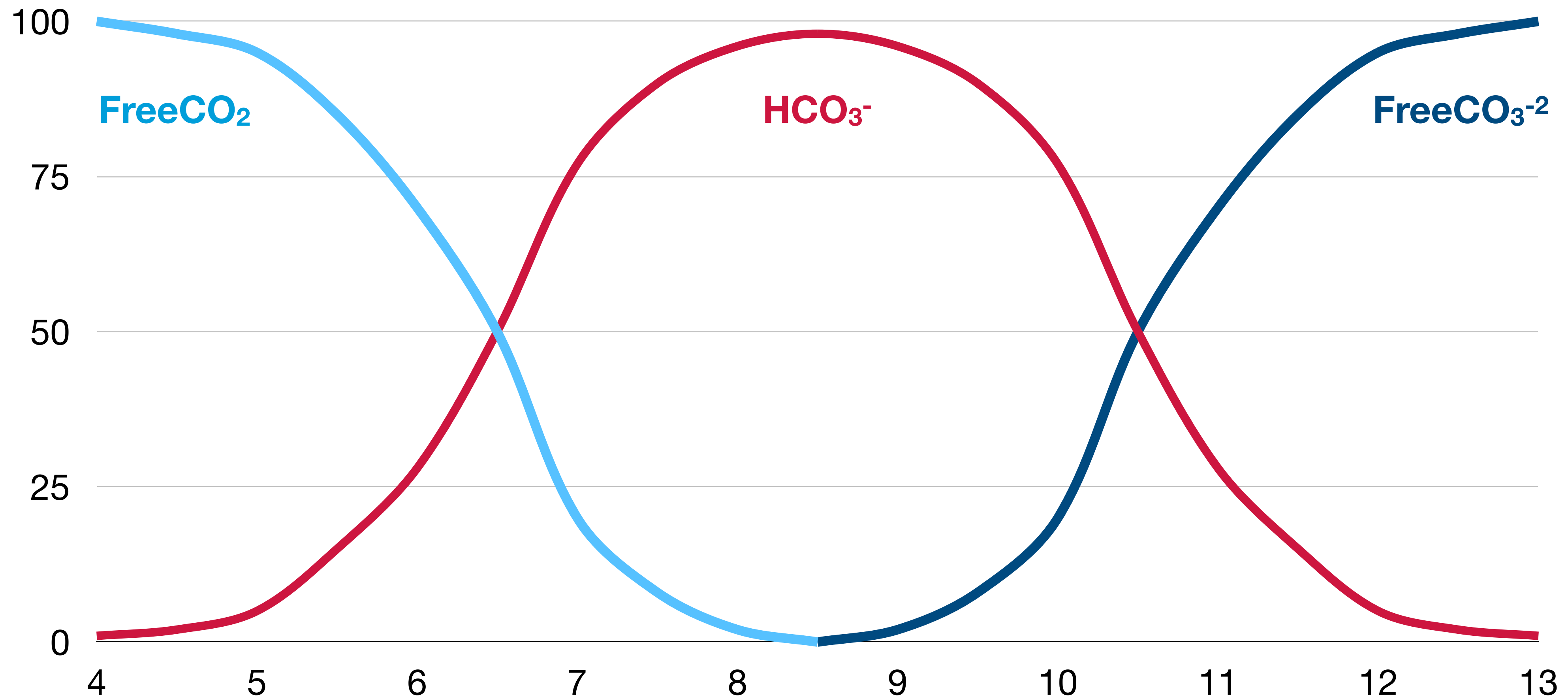
Sulfate	SO_4^-
Nitrate	NO_3^-
Chloride	Cl^-
Bicarbonate	HCO_3^-
Silica	SiO_2

pH Concerns

- Anionic softening removes carbonates/bicarbonates as well as the contaminant of concern.
- Without bicarbonates present in the water, pH decreases
- Relationship of $\text{CO}_2 + \text{HCO}_3^- + \text{CO}_3^{2-} + \text{OH}^-$
- Percentage of which of species dependent on pH in water

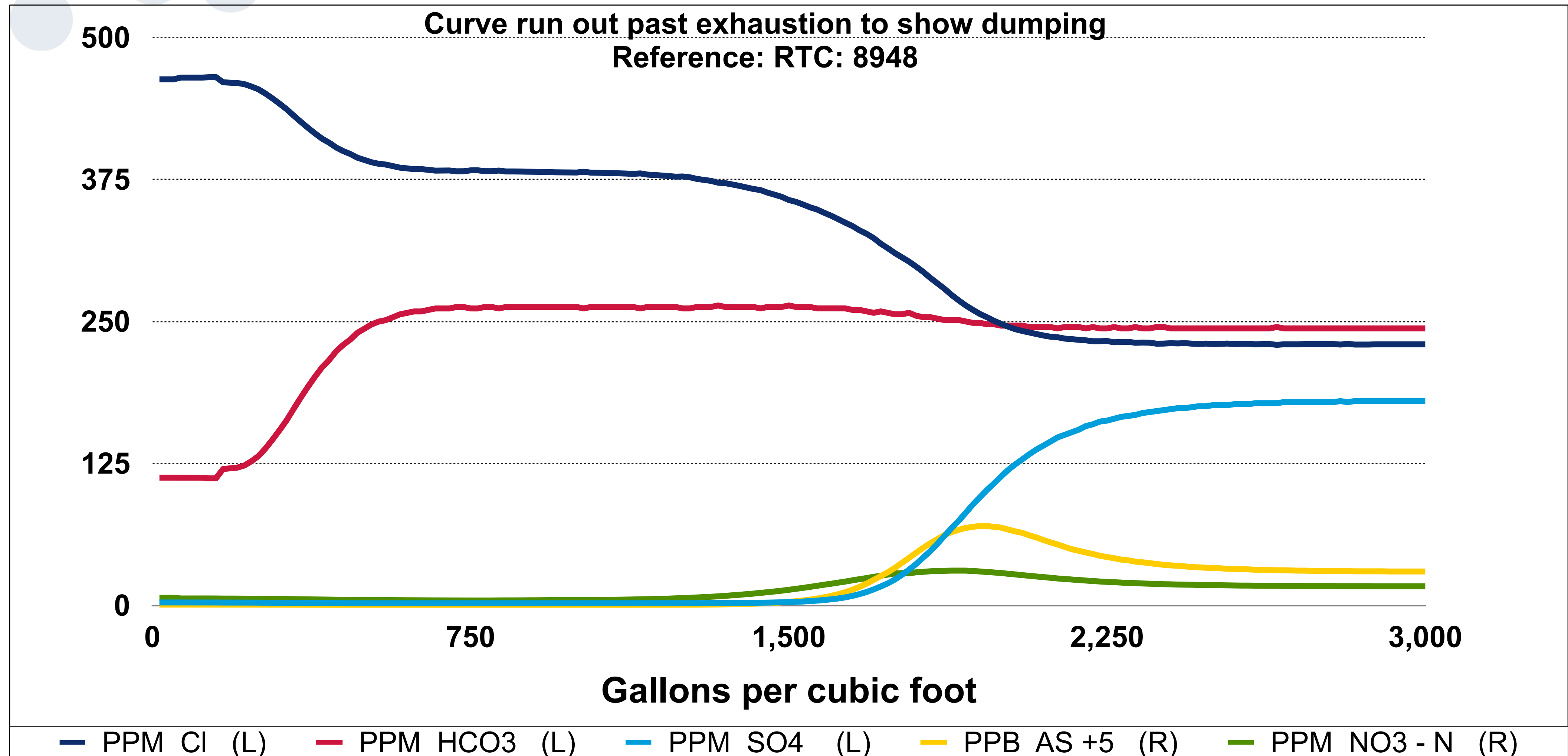
pH vs Alkalinity Relationship

Forms of inorganic carbon at different pH levels



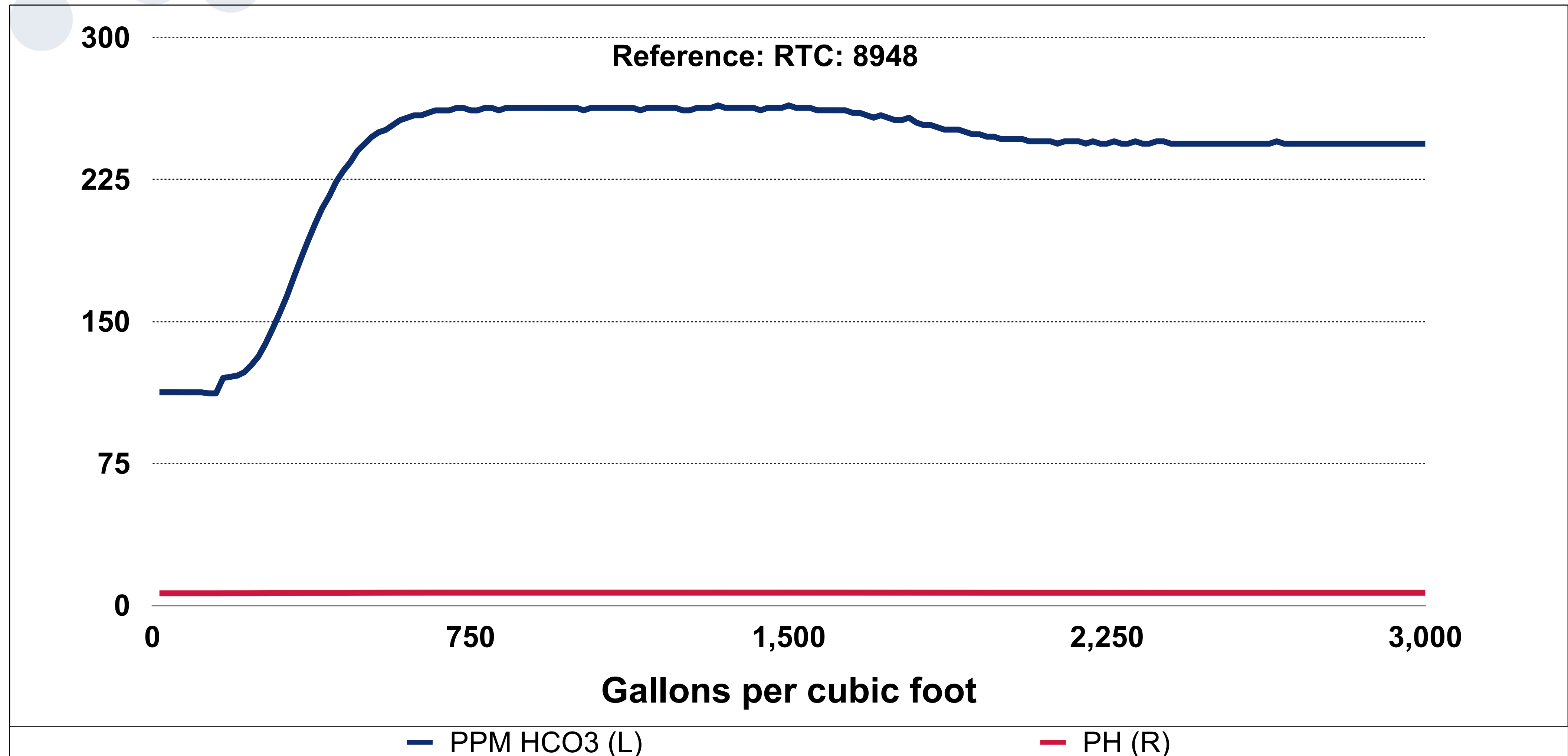
Arsenic & Nitrate Removal by Type 2 Anion Resin

Co-flow 15 lbs NaCl/cu.ft. @ 5% Brine



Arsenic & Nitrate Removal by Type 2 Anion Resin

pH Change during service cycle

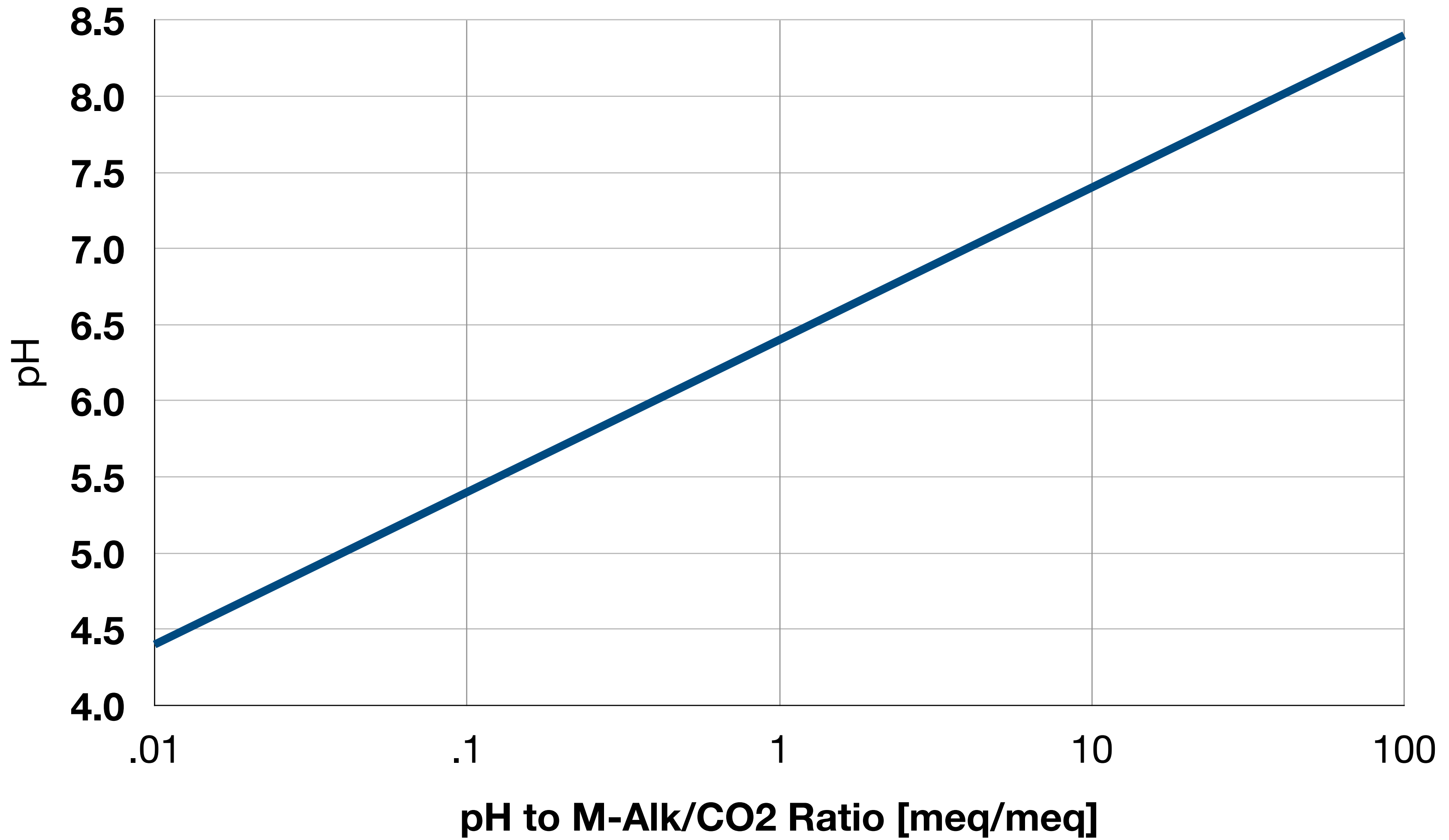


What Else Do I Need to Know?

- TDS or conductivity
- Sulfate
- Nitrate
- Chloride
- Alkalinity
- Silica
- pH

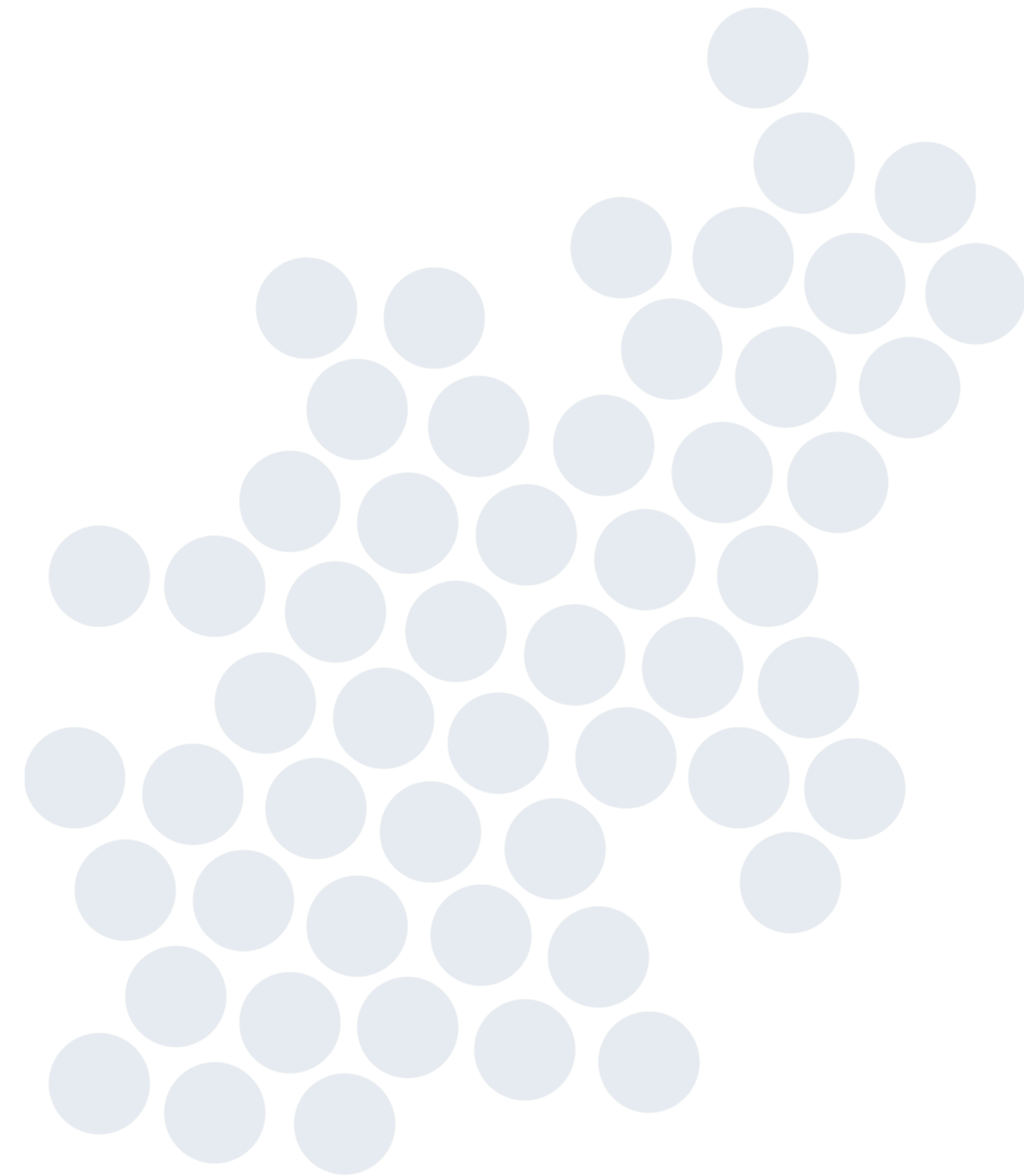


pH to M-Alk/CO2 Relationship



Calculating pH Drop

- Use Chart to calculate CO₂ from influent chemistry
 - Use of influent pH and Alkalinity data
- Reduce alkalinity by 95% to assume worse case
- Determine ratio with low alkalinity and CO₂ content
 - 5% of original alkalinity and influent CO₂
- Use chart to see what the new ratio yields for pH
- Piece of cake!!!



Calculating pH Drop Volume

- Dealkalization Calculation for Standard SBA:
 - Formula: $(175,000 * \text{ppm Alkalinity/TDS}) / \text{ppm Alkalinity}$
- Example: $(175,000 * 200/400) / 200 = 437.5$ Gallons/Cuft

Now you can determine the pH drop and for how long!

pH Correction Methods

- Product water can be buffered by addition of soda ash (Na_2CO_3) to the salt tank
 - 1 lb of soda ash to 9 lbs of salt
- Media neutralizer post anion unit
 - Calcite, Corosex, etc.
- Soda Ash or Caustic Soda (NaOH) Liquid feed post anion unit

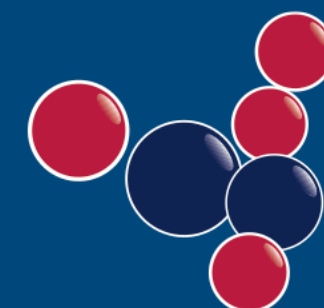
THANK YOU

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