



Color and Scale Control with Carus Polyphosphates

CARUS™ 560H and CARUS™ C-10 polyphosphates are among the most effective color and scale controlling agents used to reduce stains, discoloration, and rusty water caused by oxidized iron and manganese in source water. Carus phosphates sequester Fe, Mn, Ca, and Mg to maintain color-less soluble molecules that resist oxidation caused by aeration, disinfection, storage, and transmission of finished water. By sequestering raw water minerals at the source, the demand for chlorine is reduced, resulting in less chlorine consumption and improved water quality.

BENEFITS

- Prevent color formation from Fe/Mn and water deterioration in the system
 - Over 1.0 mg/L combined Fe/Mn treated
- Prevent carbonate scale formation from Ca/Mg hard water at threshold dosage
 - 1 mg/L polyphosphate : 200 mg/L combined Ca/Mg bicarbonate
- Effectively lower chlorine demand stabilize system residual
- Gradually remove surface deposits and corrosion by-products in water system
- Remove protective environment of bacterial regrowth
- Increase C-Factor and fire hydrant flow rates and improve valve operations
- Inhibit general surface corrosion, microbial corrosion, and pitting



Iron Particles Cause "Red Water"

TREATMENT PROGRAM



Before application



After one year

Like fingerprints, no two potable water sources are the same. Carus Chemical Company can help eliminate red and black water, prevent scaling, ensure compliance with the Lead & Copper Rule, and solve other drinking water quality headaches. By evaluating your key water quality parameters, such as pH, hardness, iron, and manganese and your treatment objectives such as elimination of red and black water and corrosion control Carus can use computer modeling to select the most cost-effective product, determine dosing requirements, and predict performance. Carus laboratory staff provides analytical services, feasibility studies, and dosage evaluations for the specific requirements of your water system.

DOSAGE & COSTS

1 mg/L of soluble iron and manganese combined requires 1-2 mg/L of total polyphosphate ion. Typical dosages of Carus sequestering agents range from 1-10 mg/L in potable drinking water. The treatment cost can range from < 1 cent to 10 cents per 1,000 gallons of water treated.

CHEMISTRY

<u>Raw Water Cations</u>	+	<u>Anionic Sequestering Agent</u>	⇒	<u>Soluble Metal Complex</u>
Iron (Fe ⁺²)		+ (PO ₃ ⁻) _n molecule	⇒	Fe-(PO ₃) ₂
Manganese (Mn ⁺²)		+ (PO ₃ ⁻) _n molecule	⇒	Mn-(PO ₃) ₂
Calcium (Ca ⁺²)		+ (PO ₃ ⁻) _n molecule	⇒	Ca-(PO ₃) ₂
Magnesium (Mg ⁺²)		+ (PO ₃ ⁻) _n molecule	⇒	Mg-(PO ₃) ₂

CARUS POLYPHOSPHATE TECHNICAL DISCUSSION

Naturally occurring iron and manganese contaminants are often detected in groundwater supplies. A growing number of water systems currently exceed the EPA Secondary Maximum Contaminant Level (SMCL) of 0.3 mg/L of iron and 0.05 mg/L of manganese. If these contaminants remain below the SMCL, or in their original soluble form they may pass undetected through the water distribution system. Above this level, soluble iron (Fe⁺²) and manganese (Mn⁺²) will gradually react with dissolved oxygen, chlorine, or oxidizing bacteria in the distribution system to form yellowish-orange or brownish-black colored insoluble particulates. Calcium (Ca⁺²) and magnesium (Mg⁺²) also found in groundwater remain soluble under most conditions, however they do react with soap to form insoluble salts (soap scum). When heated, calcium and magnesium form insoluble hard water scale.

Unightly color, turbidity, and sediment will eventually develop in the water. Scale deposits will form throughout distribution mains unless the Fe, Mn, Ca, and Mg is chemically bound-up or suspended with a sequestering agent. A single product, such as CARUS™ C-10, or CARUS™ 560H blended phosphate would be selected based on specific water quality data (Fe, Mn, Ca, pH, hardness, etc.) and treatment goals (e.g. scale, corrosion inhibition, color control, etc.).



Extreme Calcium Build-Up Restricts Water Flow

All phosphate ions are negatively charged particles (anions) with an electronic attraction for oppositely charged positive ions (cations) in the water or on a pipe surface. When soluble cations such as Fe⁺², Mn⁺², Ca⁺², or Mg⁺² come in contact with the polyphosphate anions, they react in various degrees to form a coordinated molecular structure that remains soluble in the water. As a result of this chemistry, application of Carus polyphosphates into water will delay the oxidation, color formation, and precipitation of metallic cations in a water system.

Carus sequestering agents are injected via a chemical metering pump at the wellhead prior to other chemical additives (chlorine, fluoride, caustic soda, etc.). If permissible, these agents are injected down the well casing to mix with groundwater at the pump intake



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CARUS CHEMICAL COMPANY
315 Fifth Street • Peru, IL 61354
Tel: (815) 223-1500 Fax: (815) 224-6697
Web: www.caruschem.com • E-Mail: salesmkt@caruschem.com

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