

OPTIDOSE™ 4210 Traceable Polymaleic Acid Scale Inhibitor and Dispersant

Description

OPTIDOSE 4210 traceable polymaleic acid polymer is a scale inhibitor designed to eliminate calcium carbonate scale formation in industrial water treatment applications. The presence of OPTIDOSE 4210 homopolymer can be accurately monitored in process water with the use of our OPTIDOSE traceable polymer test kit.

Benefits

Performance

- General purpose scale inhibitor/dispersant - effective on a variety of foulants and scale formers (calcium phosphate, calcium carbonate, calcium sulfate and silt).
- Free polymer levels detected accurately at ppm levels with the use of the OPTIDOSE test kit.
- Superior calcium carbonate inhibition, performs in high alkalinity/hardness and high total dissolved solids systems.
- Enhances inhibition properties in blends with high performance dispersant polymers (e.g., OPTIDOSE 2000 and OPTIDOSE 3100).
- "Smart Polymer" - used in high hardness waters that have side stream softening allowing hardness removal in the softener.

Polymer Characteristics

- Phosphorus Free -
Can replace phosphonates as scale control agents.
No phosphorus discharge problems.
- Stable at all pH levels.

General

- FDA Cleared -
Under 21CFR173.310 (Boiler Water Additives)^(a)
Under 21CFR173.45 (Polymaleic Acid and its Sodium Salt)^(b) for sugar processing.
- Manufactured in an ISO 9002 certified manufacturing plant.

(a) As a boiler water additive in the preparation of steam that will contact food provided the level of this product does not exceed 1 ppm in boiler feed water.

(b) Provided the level of this product does not exceed 4 ppm (calculated as the acid) by weight of the beet or cane sugar juice or liquor process steam.

Table 1
Typical Physical Properties

These properties are typical but do not constitute specifications.

Appearance	Clear, amber liquid
Total Solids, % ⁽¹⁾	50
pH	1.0-2.0
Molecular Weight	500-1000
Specific Gravity	1.16

⁽¹⁾Measured by subtracting Karl Fischer water from 100.

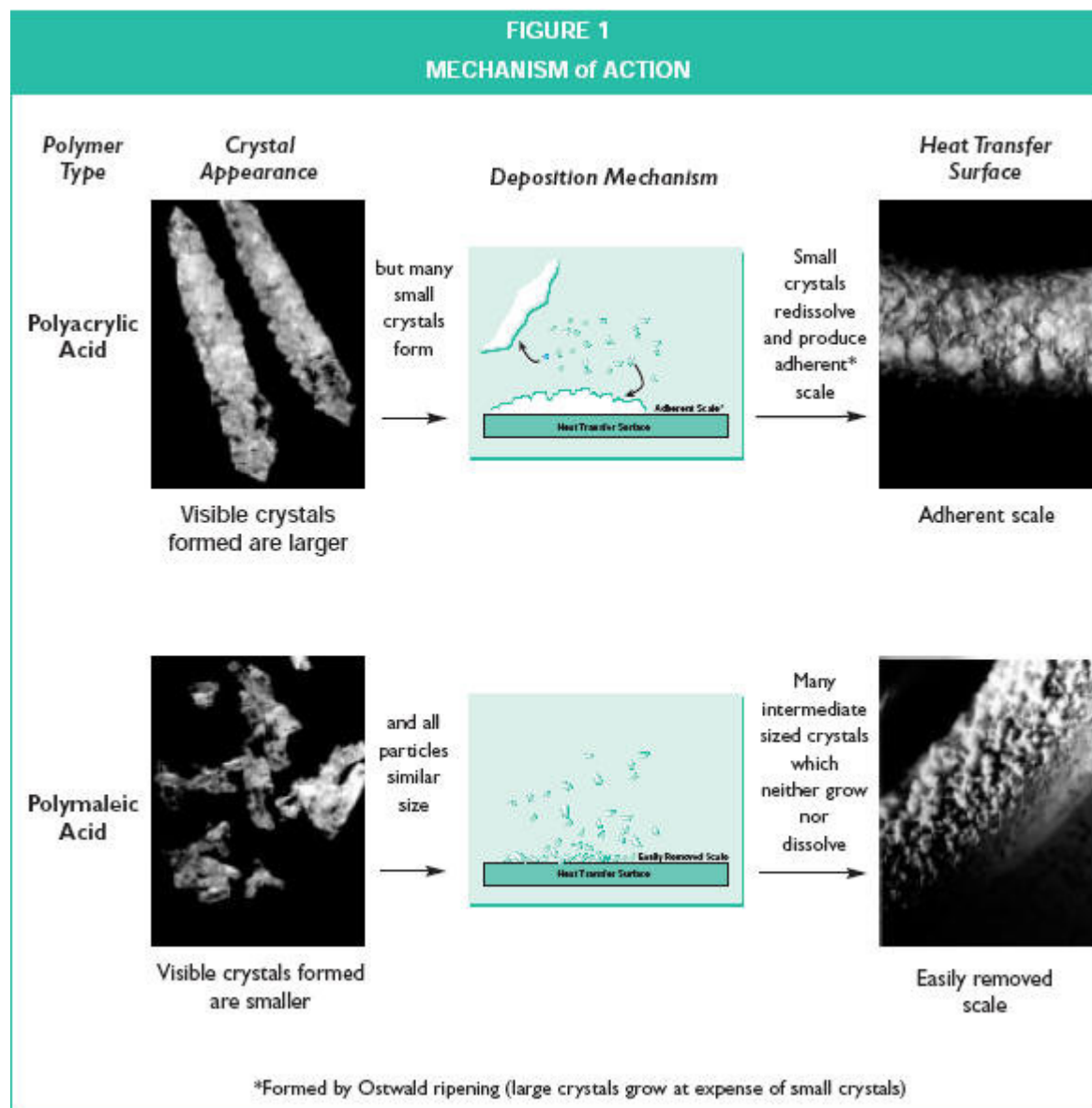
Mechanism of Action

OPTIDOSE 4210 polymer inhibits scale buildup on surfaces through at least three mechanisms:

- Solubility enhancement or threshold effect, which reduces precipitation of low solubility inorganic salts.

- Crystal modification, which deforms the growing inorganic salt crystals to give small, irregular, readily fractured crystals that do not adhere well to surfaces.
- Dispersing activity, which prevents precipitated crystals or other inorganic particles from agglomerating and depositing on surfaces.

In addition to the above mechanisms which are common to many types of inhibitors and dispersants, OPTIDOSE 4210 functions by a unique crystal growth mechanism. In the presence of OPTIDOSE 4210, calcium salt crystals grow to uniform intermediate sizes and do not form large crystals. These crystals do not strongly adhere to surfaces and are readily removed by flowing water. Other inhibitors allow the formation of nonuniformly sized crystals. The small crystals in this distribution redissolve and incorporate on large crystals. This process, called Ostwalds ripening, causes large crystals to grow at the expense of small crystals due to the difference in their surface to volume ratio. The largest crystals are often found on equipment surfaces, and ordinary inhibitors can accelerate their growth. OPTIDOSE 4210 is a superior scale inhibitor because it prevents the formation of these large crystals.

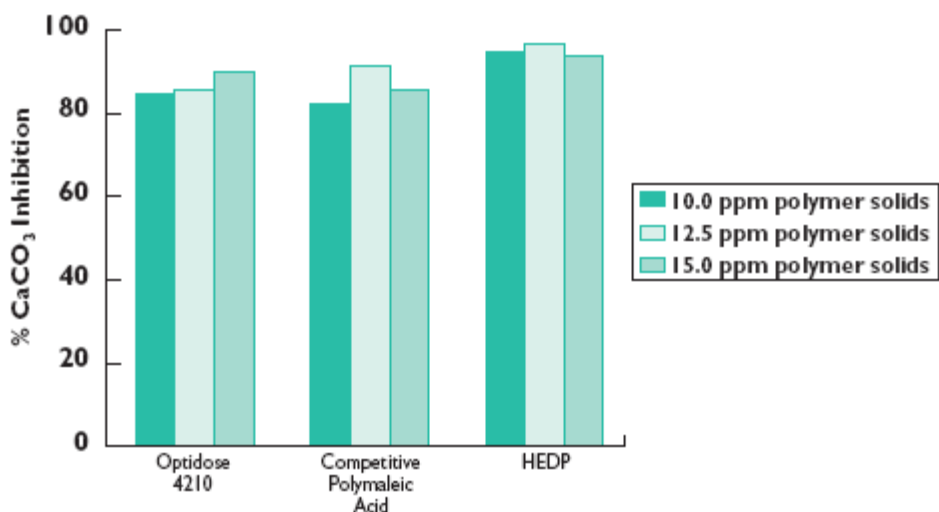


Performance Data

Calcium Carbonate Inhibition

Under high pH and alkalinity conditions, calcium carbonate scale formation is a potential problem that can be prevented by threshold inhibition and crystal modification. Figure 2 shows that from 10 to 15 ppm polymer solids the performance of OPTIDOSE 4210 polymer is equivalent to a competitive polymaleic acid. OPTIDOSE 4210 polymer is only slightly less effective than HEDP (1-hydroxyethylidene-1,1-diphosphonic acid) and approaches the performance of HEDP at the 15 ppm level.

FIGURE 2
CALCIUM CARBONATE INHIBITION



Test Conditions

400 ppm Ca, as CaCO₃

100 ppm Mg, as CaCO₃

400 ppm M-Alk, as CaCO₃

2000 ppm NaCl, as NaCl

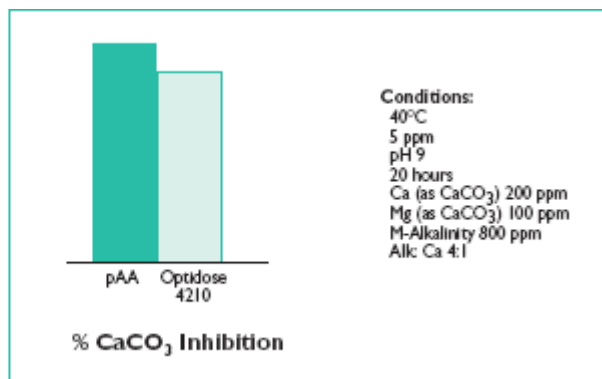
3 ppm PO₄, as PO₄

65°C, 44 hours, pH 9.0

% CaCO₃ Inhibition = $\frac{(\text{Ca}^{+2})_{\text{sample}}}{(\text{Ca}^{+2})_{\text{initial}}}$

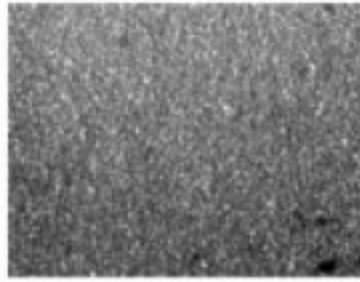
pAA is a good general purpose scale inhibitor.

pAA ≥ Optidose 4210

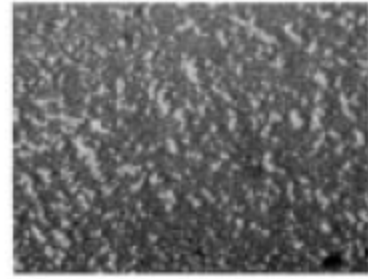


Optidose 4210 is excellent at controlling calcium carbonate on mild steel heat transfer surfaces. The reason being that the pH on a cornered steel surface is >10.

Optidose 4210 > pAA



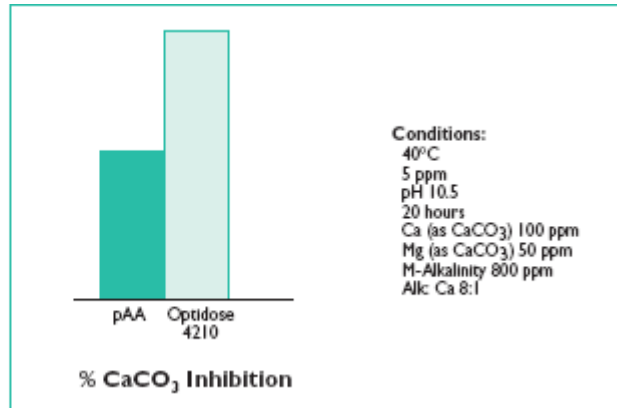
Optidose 4210



pAA

Reason:

Optidose 4210 has superior performance at high pH, and on a corroding mild steel surface at pH >10.

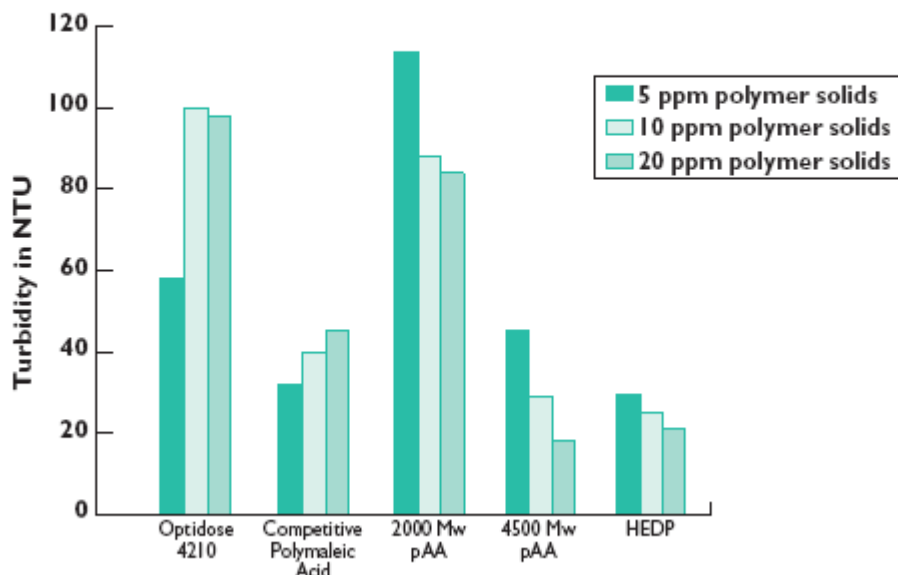


Dispersing Activity

Industrial cooling water contains particulate matter such as silt, clays and calcium-based precipitates. The particles can deposit on heat transfer surfaces and produce excessive sediment in regions of low water velocity.

Kaolin clay was used to represent particles commonly found in many waters. At low polymer levels (5-20 ppm) OPTIDOSE 4210 polymer has kaolin clay dispersancy superior to a competitive polymaleic acid polymer. It is also a better dispersant than phosphonates such as HEDP. Figure 3 compares OPTIDOSE 4210 to these two materials and also to two polyacrylic acids.

FIGURE 3
KAOLIN DISPERSANCY



Test Conditions

1000 pm Hydrite UF Kaolin
200 ppm Ca, as CaCO₃
pH 7.5
2-hour settling time
measure turbidity of top 20 ml of 100 ml sample

Material Safety Data Sheets

Rohm and Haas Company maintains Material Safety Data Sheets (MSDS) on all of its products. These contain important information that you may need to protect your employees and customers against any known health and safety hazards associated with our products. We recommend you obtain copies of MSDS for our products from your local Rohm and Haas technical representative or the Rohm and Haas Company. In addition, we recommend you obtain copies of MSDS from your suppliers of other raw materials used with our products.

Under the OSHA Hazard Communication Standard, workers must have access to and understand MSDS on all hazardous substances to which they are exposed. Thus, it is important that appropriate training and information be provided to all employees and that MSDS be available on any hazardous products in their workplace.

Rohm and Haas Company sends MSDS on non-OSHA hazardous as well as OSHA-hazardous products to both "bill-to" and "ship-to" locations of all our customers upon initial shipment (including samples) of all of our products. Updated MSDS are sent upon revision to all customers of record.

ISO 9002 Certification

All OPTIDOSE products are produced in ISO 9002-certified manufacturing facilities.

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