

ACUMER™ 2100 Scale Inhibitor and Dispersant

Typical Properties

These properties are typical but do not constitute specifications.

Appearance	Clear Solution to slightly hazy
Chemical nature	Carboxylate/Sulfonate copolymer
Average molecular weight	11,000 (Mw)
Total solids (%)	37
pH as is (at 25°C)	4.8
Viscosity Brookfield (mPa.s/cps at 25°C)	225

Chemistry and Mode of Action

ACUMER 2100 copolymer combines two functional groups: strong acid (sulfonate) and weak acid (carboxylate) that provide optimal anti-scale/dispersant efficiency through the following different mechanisms:

- Solubility enhancement by threshold effect, which reduces precipitation of sparingly soluble inorganic salts (calcium carbonate in particular).
- Crystal modification, which deforms the growing inorganic salt crystal to give small, irregular, readily fractured crystals that do not adhere well to surfaces and can be easily removed during cleaning operations.
- Dispersing activity, which prevents precipitated crystals or other inorganic particles from agglomerating and depositing on surfaces. The sulfonate groups increase the negative charge of the carboxylate groups adsorbed onto particles and, by then, reinforce the repulsion between the particles, preventing them from aggregating into larger particles which can settle and deposit on tube surfaces and low flow areas.

Performance

ACUMER 2100 provides superior stabilization of calcium phosphate, zinc and calcium carbonate. It also prevents calcium sulfate and calcium oxalate scales, even in extreme pH environments (pH 4-10).

In addition, ACUMER 2100 is a strong dispersant in keeping the silt and commonly encountered inorganic particles suspended and in preventing their settling out onto heat transfer surfaces.

Applications

- Industrial water treatment:
 - Dispersant for boiler sludge control
- Pulp and paper process:
 - Dispersant and scale inhibitor

Benefits of ACUMER 2100

- Contains no phosphorus, making its use acceptable where legislation requires that discharge waters contain no or low phosphorous.
- Exhibits good stability in the presence of hypochlorite.
- Shows good anti-scaling efficiency against calcium carbonate, calcium sulfate and calcium oxalate at low dosage over a wide range of pH, water hardness and temperature conditions.
- Exhibits a good thermal stability.
- Offers a very strong dispersant activity.

Bench Test Data

	Fe ₂ O ₃	CaPO ₄
Controls & Non FDA-Cleared	Dispersancy	Particles < 0.2μ
Polymers	NTU	%
No polymer	58	8
ACUMER 3100	435	94
Sulfonated Styrene Maleic Anhydride	260	61
FDA-Cleared Boiler Polymers		
ACUMER 2100	364	37
Phosphinicarboxylic	105	19
Polymaleic Acid	63	19
Acrylic/Acrylamide Copolymer	48	15
Polymethacrylic Acid	46	10
Test conditions:		
ppm Ca ²⁺	200 (as CaCO ₃)	500 (as CaCO ₃)
ppm PO ₄ (as PO ₄)	0	15
ppm active polymer	3	20
ppm Fe (as Fe ₂ O ₃)	700	0
pH	10.6	11.0

Performance Data Pulp and Paper Processing

	CaCO ₃	%CaCO ₃	%CaSO ₄	%CaC ₂ O ₄
Polymer	Dispersancy	Inhibition	Inhibition	Inhibition
ACUMER 2100	175	59	97	44
ACUMER 1000	47	56	100	52
ACUMER 1850	7	59	31	44
No treatment	0	0	0	0

Test conditions:
 Calcium carbonate dispersancy: 500 ppm ca as CaCO₃, 250 ppm Mg as CaCO₃, 500 ppm M-Alkalinity as CaCO₃, 500 ppm precipitated CaCO₃, 5 ppm HEDP, 5 ppm polymer, pH 9, 1 hour settling.
 Calcium carbonate inhibition: 600 ppm Ca as CaCO₃, 300 ppm Mg as CaCO₃, 5 ppm HEDP, 5 ppm polymer, pH 9, 54°C, 20 hours.
 Calcium sulfate inhibition: 5450 pp CaSO₄, 0.5 ppm polymer, pH 7, 70°C, 72 hours.
 Calcium oxalate inhibition: 150 ppm CaC₂O₄, 5 ppm polymer, pH 7, 50°C, 18 hours.

Research Boiler Data

	% Scale Reduction	
Polymer	10 ppm	20 ppm
ACUMER 3100	98.7	100
ACUMER 2100*	94.2	100
Acrylic/Acrylamide copolymer*	-	97.3
Sulfonated Styrene Maleic Anhydride	-	79.0
Polymethacrylic Acid*	-	66.7

* FDA cleared

Test conditions: 400 psig, phosphate cycle, 120 ppm Fe₂O₃, 47 hours, 50000 BTU/ft²/hr

Storage Recommendation

Freezing or long term cold storage of ACUMER 2100 may cause some separation of the components. Although product performance is not impaired as long as the whole container is heated and well mixed, it is recommended to keep ACUMER 2100 out of freezing.

FDA Clearance

ACUMER 2100 complies with the FDA Food Additives regulations indicated below, provided that the final formulation meets the limitations and other conditions prescribed by the regulation.

21 CFR 173.310* Boiler water additives.

21 CFR 176.170** Components of paper, paperboard in contact with aqueous and fatty food.

21 CFR 176.180** Components of paper, paperboard in contact with dry food.

* ACUMER 2100 do not exceed 20 ppm (active) in boiler feedwater.

** ACUMER 2100 can be used as a scale inhibitor prior to the sheet-forming operation in the manufacture of paper and paperboard and used at level not to exceed 1.0 kg of copolymer per ton of dry paper and paperboard.

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.

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