



**ACUMER™ 2100**  
Scale Inhibitor and Dispersant

Typical Properties

These properties are typical but do not constitute specifications

Property	Typical Values
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 can be used to 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 exceptional 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.

Suggested 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

	Fe2O3	CaPO4
<b>Controls &amp; Non FDA-Cleared</b>	<b>Dispersancy</b>	<b>Particles &lt; 0.2µ</b>
<b>Polymers</b>	<b>NTU</b>	<b>%</b>
No polymer	58	8
ACUMER™ 3100	435	94
Sulfonated Styrene Maleic Anhydride	260	61
<b>FDA-Cleared Boiler Polymers</b>		
ACUMER 2100	364	37
Phosphinocarboxylic	105	19
Polymaleic Acid	63	19
Acrylic/Acrylamide Copolymer	48	15
Polymethacrylic Acid	46	10
Test conditions:		
ppm Ca <sup>2+</sup>	200 (as CaCO <sub>3</sub> )	500 (as CaCO <sub>3</sub> )
ppm PO <sub>4</sub> (as PO <sub>4</sub> )	0	15
ppm active polymer	3	20
ppm Fe (as Fe <sub>2</sub> O <sub>3</sub> )	700	0
pH	10.6	11.0

## Performance Data Pulp and Paper Processing

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

**Calcium carbonate dispersancy:** 500 ppm Ca as CaO<sub>3</sub>, 250 ppm Mg as CaCO<sub>3</sub>, 500 ppm M-Alkalinity as CaCO<sub>3</sub>, 500 ppm precipitated CaCO<sub>3</sub>, 5 ppm HEDP, 5 ppm polymer, pH 9, 1 hour settling.

**Calcium carbonate inhibition:** 600 ppm Ca as CaCO<sub>3</sub>, 300 ppm Mg as CaCO<sub>3</sub>, 5 ppm HEDP, 5 ppm polymer, pH 9, 54°C, 20 hours.

**Calcium sulfate inhibition:** 5450 pp CaSO<sub>4</sub>, 0.5 ppm polymer, pH 7, 70°C, 72 hours.

**Calcium oxalate inhibition:** 150 ppm CaC<sub>2</sub>O<sub>4</sub>, 5 ppm polymer, pH 7, 50°C, 18 hour

## Research Boiler Data

Polymer	% Scale Reduction	
	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 Fe<sub>2</sub>O<sub>3</sub>, 47 hours, 50000 BTU/ft<sup>2</sup>/hr

## FDA Clearance

ACUMER™ 2100 complies with the U.S. Food and Drug Administration (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.

Handling  
Precautions

Before using this product, consult the Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for details on product hazards, recommended handling precautions and product storage.

Storage

Store products in tightly closed original containers at temperatures recommended on the product label.  
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 U.S. Food and Drug Administration (FDA) ACUMER above freezing temperatures.

Disposal  
Considerations

Dispose in accordance with all local, state (provincial) and federal regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user's responsibility to verify that treatment and disposal procedures comply with local, state (provincial) and federal regulations. Contact your Dow Technical Representative for more information.

Product  
Stewardship

Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products - from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

Customer Notice

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to ensure that Dow products are not used in ways for which they are not intended or tested. Dow personnel are available to answer your questions and to provide reasonable technical support. Dow product literature, including safety data sheets, should be consulted prior to use of Dow products. Current safety data sheets are available from Dow.

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