

ACUMER™ 1510 Polyacrylic Acid Homopolymer

Description

ACUMER 1510 is a polyacrylic acid hydrophilic colloidal solution, similar in properties to water-soluble natural gums. It is supplied as a clear, colorless, viscous stable solution. Applications include the modification of aqueous formulations for such end uses as cleaners, binders, adhesives, and emulsion paints. The sodium, potassium, and ammonium salts are effective thickeners and dispersants useful in both natural and synthetic latex systems. ACUMER 1510 may have utility in reproduction processes, because the complexes with ammonium dichromate are photosensitive. In ceramic applications, ACUMER 1510 imparts dry strength, dispersant action, and improved workability of the clays.

Performance Advantages

Unlike many natural gums, ACUMER 1510 is stable to hydrolysis and is not susceptible to bacterial degradation. This resistance to degradation allows great latitude in the choice of storage conditions. Formulations containing ACUMER 1510 exhibit uniform consistency.

Typical Properties

These properties are typical but do not constitute specifications.

Solids content (%)	25
pH (5% aqueous solution)	≈ 2
Dilutability with water	Infinite
Molecular weight (Mw)	≈ 60.000
Viscosity Brookfield (mPa.s/cps at 25°C)	
5% total solids	15
12.5% total solids	15
25% total solids	160

The table below lists approximate viscosities of solutions of ACUMER 1510 at various levels and temperatures.

Viscosity of Aqueous Solutions of ACUMER 1510 Polyacrylic Acid

Solids content (%)	Viscosity, centistokes		
	@ 26°C	@ 38°C	@ 54°C
5.0	-	2.3	-
6.2	3.9	3.1	2.4
8.3	6.5	5.1	3.7

Compatibility with Organic Solvents and Water-Soluble Polymers

In general, ACUMER 1510 is compatible with water-soluble organic solvents. The following show miscibility in all proportions: methanol, ethanol, methoxyethanol, butoxyethoxyethanol, glycerol, ethylene glycol, t-butanol, acetone, and dimethyl formamide.

ACUMER 1510 is compatible with some water-soluble polymers, for example, in all proportions with ACRY SOL™ GS (sodium polyacrylate). At low concentrations, poly(vinyl alcohol) seems to be compatible with ACUMER 1510, but higher levels of poly(vinyl alcohol) give precipitates. ACUMER 1510 is not compatible with solutions of carboxymethylcellulose, poly(methyl vinyl ether), or styrenemaleic acid copolymers. It is possible that the sodium salts of ACUMER 1510 might be more compatible with these water soluble polymers than are the free polyacids.

Effect of Salts and Inorganic Acids

Saturated solutions of sodium chloride or sodium sulfate precipitate ACUMER 1510 quickly; the precipitate is soluble in water. Mixing 5 or 10 percent solutions of the polyacid with a saturated solution of disodium hydrogen phosphate (Na_2HPO_4) however, shows complete compatibility.

Salts of heavy metals form precipitates, some capable of being redissolved, others totally insolubilized. Barium, calcium, and aluminum salts give soluble precipitates, but iron and copper salts form insoluble products.

Adding high levels of inorganic acid to solutions of ACUMER 1510 polyacid increases the acidity of the mixtures and reduces the degree of ionization and solubility of the polymers. The initial appearance of turbidity is followed by complete precipitation. Adding 50% solutions of sulfuric or phosphoric acid to solutions containing 5 or 10 percent of ACUMER 1510 polyacid causes rapid appearance of turbidity and subsequent precipitation. When the supernatant acid layer is decanted, the precipitated polyacid redissolves in pure water. At lower levels, or with weaker acids, compatibility is complete; this is observed with 5 or 10 percent solutions of ACUMER 1510 acid and 5 or 35 percent hydrochloric acid, 5 percent phosphoric acid, and glacial acetic acid.

Preparation of Salts

ACUMER 1510 polyacrylic acid has an equivalent weight of 72 on a solids basis. It can be neutralized by stoichiometric amounts of bases to give the corresponding alkali or ammonium salts. The viscosity of ACUMER 1510 acid as supplied is slightly higher than that of these salts at the same solids content. At 5-percent solids content, however, the salts are much more viscous than the free acids and the solutions may be used to thicken latexes.

The sodium, potassium, and ammonium salts of ACUMER 1510 acid is an effective dispersant for various pigments such as zinc oxide, titanium dioxide, calcium carbonate, and barium sulfate. The lack of color of these dispersants offers an advantage in making dispersions in which darkly colored natural dispersants may affect shading. Because of their hydrolytic and thermal stability, the alkali salts of ACUMER 1510 acid retain their dispersant activity for prolonged periods.

Film Properties

Dried films of ACUMER 1510 polyacid adhere tenaciously to glass, aluminum, copper, iron, wood, and paper. The films redissolve slowly when immersed in water for 24 hours at ambient temperature. When immersed in 10-percent solutions of sulfuric, hydrochloric, or nitric acid or sodium chloride, they redissolve much more slowly.

The films become insoluble when reacted with glycerol or other polyhydric alcohols. Baking 30 minutes at 150°C gives a completely insoluble colorless film. Heating the diethanolamine salt also forms an insoluble product.

Air-dried films of ACUMER 1510 polyacid are hygroscopic and flexible at high humidity. They become brittle, however, when dried thoroughly. Some partial salts give films more flexible than those of the polyacids, probably because of greater hygroscopicity. The partial salt made by adding 25 percent (based on weight of polyacid) triethanolamine yields such a flexible film.

As stated above, adding ammonium dichromate to a solution of ACUMER 1510 polyacid produces a film that is insolubilized by exposure to sunlight or ultraviolet light.

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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