HARWICK STANDARD
DISTRIBUTION CORPORATION

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www.harwickstandard.com

ISO 9001-2000
REGISTERED

METALLIC STEARATES
FOR RUBBER AND PLASTICS

Harwick Standard Distribution Corporation markets the complete line of Metallic Stearates manufactured by Ferro Corporation-Polymer Additives Division, Cleveland, Ohio. This includes stearates of Aluminum, Barium, Calcium, Magnesium, Tin (Stannous), and Zinc. These products are produced by the reaction of a linear, even numbered, carboxylic acid from C_8 to C_{22} (commonly referred to as fatty acids) and a metal compound by either fusion or precipitation techniques. The physical properties of a specific metallic soap are determined largely by the particle size, particle size distribution, and particle shape. These parameters are controlled by various precipitation, grinding, and classification techniques.

The following is a description of the various classes of metallic soaps and the typical properties of the various grades offered by Harwick Standard.

ALUMINUM SOAPS

Being a trivalent metal, aluminum can form mono-, di-, or tri-soaps containing increasing percentages of fatty acid. These soaps are almost exclusively prepared by the precipitation process. As a class, they are usually coarser and more resinous than other common metallic soaps. For a given acid, the mono-derivative is generally the highest melting and the tri-soap the lowest. Most aluminum soaps are insoluble in water and low molecular weight alcohols, ketones, and esters. In hydrocarbons, chlorinated solvents, and fatty chemicals, they produce viscous gels.

Commercially, the most important property of aluminum soaps is their ability to raise the viscosity of organic fluids. Collectively, these products offer a variety of gelling properties.

One of the earliest uses of aluminum soaps was as a thickening agent in the manufacture of petroleum greases. Today, however, they are widely used in the manufacture of paint, ink, adhesives, caulks, and vinyl plastisols.

The types of gels obtainable with aluminum soaps vary in viscosity from slightly bodied liquids to heavy pastes, and in consistency from buttery to rubbery. The exact nature of the gel depends on the type and concentration of the soap, the polarity of the solvent, and the manner in which the gel is prepared.

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ALUMINUM SOAPS (continued)

Aluminum distearate is the most widely used of the aluminum soaps. To achieve the optimum degree of thickening, this soap is generally dispersed in the cold vehicle and slowly heated with agitation to 150-320°F. Upon cooling, a gel forms. In some applications, the cooled gel is subsequently, mechanically sheared to increase its stability. Generally, aluminum stearates with low free acid content give stiffer gels than those with high free acid content. However, the texture of any gel can be markedly altered by the addition of polar substances such as water, alcohol or amines.

In protective coatings, Ferro aluminum stearates control viscosity and leveling characteristics, aid pigment suspension, enhance water repellence, and provide excellent flatting action. Aluminum stearates are widely used in wire drawing compounds, slushing oils, and forging oils to reduce die wear and prevent scoring of stamped metal parts. In the textile industry, aluminum soaps are employed as lubricants and in the waterproofing of rope and canvas. Caulk and adhesive manufacturers use aluminum stearates to improve the stability and rheological characteristics of their compounds.

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ZINC SOAPS

Zinc stearates are prepared by either precipitation or fusion techniques to offer a wide range of particle sizes and bulk densities for exacting end use requirements. Zinc stearate precipitates in the form of fine, plate-like particles, which account for its high degree of lubricity. Unlike most metallic soaps, zinc stearates exhibit sharp melting points and low melt viscosities. Zinc stearate is highly water repellent and essentially insoluble in common solvents at ambient temperatures.

In the plastics industry, zinc stearate is widely used as a lubricant for polystyrene. It has also been reported to be synergistic when used in combination with light stabilizers in polyolefins. Thermosetting molding compounds, particularly polyester premix and sheet molding compound, employ zinc stearate as a mold release in automated molding operations. Zinc stearate is the active component of many FDA approved polyvinyl chloride stabilizer systems.

Zinc stearate is the most widely used metallic soap in the powdered metallurgy field. Ferro zinc stearates are low dusting and readily incorporated into both iron and alloy powders. They provide excellent mold release, have a minimum effect on green strength, and have been known to increase die life up to 50%. Careful quality control during manufacture ensures that the particle size and distribution of Ferro zinc stearate for the powdered metallurgy industry are uniform from batch to batch. This is reflected by reproducible results in production runs.

In the paint industry zinc stearate is employed as a flatting agent and sanding aid in lacquers. In this application, extremely fine particle size is the prime requirement. This imparts the ability to simply stir-in the zinc stearate, thereby eliminating expensive grinding operations. Lacquer grade zinc stearates are specially formulated to buffer the action of acidic catalysts and thereby resist bloom in the finished topcoats. Zinc stearate has a minimum effect on the rheology of paint vehicles and does not soften the resulting coatings.

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SPECIALTY METAL SOAPS

Barium and tin comprise Ferro's metal soap line. These materials are primarily used as components of PVC stabilizers.

Barium soaps can be prepared by either fusion or precipitation techniques. They are characterized by extremely high melting points and low solubilities. These properties make them ideally suited for high temperature lubricant applications in the plastics molding, metalworking, and petroleum lubricant industries. In polyvinyl chloride stabilizers, barium soaps are normally used in conjunction with antioxidants, and chelators in synergistic combinations. The primary function of the barium soap is to lubricate and contribute to long term heat stability.

Tin (stannous) stearate is the lowest melting stearate in the Ferro line. It is prepared by a unique process and exhibits many novel properties unattainable with other metallic soaps. Ferro was the first to recognize the usefulness of this material as a stabilizer for polyvinyl chloride and holds basic patents on this use.

Tin stearate is FDA approved as a nontoxic stabilizer for use in PVC food containers. In plastic applications outside the vinyl area, tin stearate is creating a growing interest as a unique lubricant with antistatic characteristics.

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CALCIUM AND MAGNESIUM SOAPS

Calcium and magnesium stearates are quite similar in their physical properties. Both can be prepared commercially by either precipitation or fusion techniques. Both are characterized by a high degree of lubricity, excellent color and color stability, and extremely low solubility in water and all common organic solvents. Plastic processors use these materials in a wide variety of lubricating applications. Calcium stearate serves as an excellent mold release agent for thermosetting molding compounds. In rigid vinyl extrusions, calcium stearate markedly improves the dynamic thermal stability of compounds employing organotin and antimony mercaptide-type heat stabilizers. Calcium stearate is employed as a scavenger for catalyst residues and as a processing aid in polypropylene. Both calcium and magnesium stearates are utilized in FDA approved nontoxic stabilizers for polyvinyl chloride bottles and food wrap. Magnesium stearate is often preferred to calcium stearate as a lubricant for ABS injection molding compounds.

Papercoaters employ calcium stearate to lubricate and prevent dusting in high speed calendering operations. In addition, the calcium stearate imparts gloss and water repellence to the finished sheet.

In foundry applications, calcium stearate is used extensively in shell molding to increase the flow of resin-coated sand, thereby achieving greater density and high tensile strengths in shells and cores.

Concrete manufacturers incorporate calcium stearate to improve flow and prevent caking in dry mix, to waterproof and affect cure times, and to impart release properties.

Paint formulators use both calcium and magnesium stearates to flatten finishes, control wet out and leveling, and aid in pigment grinding operations. Magnesium stearate is utilized as a viscosity depressant for aluminum stearate gels.

There are several areas where magnesium stearates appear to be preferred to calcium stearates. The chief among these is the cosmetic, pharmaceutical, and food additive areas. Being an extremely efficient dry lubricant, magnesium stearate prevents caking and promotes flow in a wide variety of powders and granular substances. In the pharmaceutical industry, it aids in capsule filling and tableting operations. In addition, it improves the stability, smoothness, and texture of a variety of emulsions, dispersions, creams, lotions, and ointments.

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TYPICAL PROPERTIES

Product	Total Ash %	Soluble Salts %	Free Fatty Acid %	Moisture %	Soft. Point °C	Fineness U.S.Std. Sieve %Thru/ Mesh	Apparent Density g/cc
Aluminum Stearate 505	8.7	0.5	3.5	1.0	230	95/200	0.4
Aluminum Stearate 303	8.7	0.5	3.5	0.6	155	98/200	0.2
Aluminum Stearate 404	7.1	0.5	24.0	1.0	109	90/200	0.2
Calcium Stearate 114-36	9.3	0.1	0.4	2.4	155	99.9/200	0.2
Calcium Stearate Wettable	9.5	0.1	0.4	2.4	155	99.9/200	0.2
Calcium Stearate 15F (Fused)	9.9	----	0.3	2.5	155	20/200	0.3
Magnesium Stearate 90	8.0	----	0.6	2.8	147	99.7/200	0.3
Magnesium Stearate NF (USP)	7.8	----	0.6	2.8	147	99.7/200	0.3

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TYPICAL PROPERTIES, Continued

Product	Total Ash %	Soluble Salts %	Free Fatty Acid %	Moisture %	Soft. Point °C	Fineness U.S.Std. Sieve %Thru/ Mesh	Apparent Density g/cc
Zinc Stearate ACF	13.4	0.3	0.5	0.4	120	99.8/200	0.3
Zinc Stearate D	14.7	0.3	0.3	0.6	120	99.8/200	0.2
Zinc Stearate F Prill	15.0	nil	0.5	0.5	120	99.9/14	0.6
Zinc Stearate USP	13.4	0.3	0.3	0.4	120	99.8/200	0.3
Zinc Stearate Wettable	14.0	0.3	0.3	0.4	120	99.8/200	0.2
Zinc Stearate FRP	14.6	----	0.3	0.3	120	99.8/200	0.3
Zincloid (Aqueous Paste 20% Solids)	13.5	----	0.4	----		99.8/200	0.2