PLAINTIFF'S EXHIBIT

BOND-476

THOMPSON-HAYWARD CHEMICAL COMPANY

4330 GERALDINE AVENUE • ST. LOUIS, MISSOURI 63115 • 314 389-4740

20 September 1977

Bondex International
3616 Scarlet Oak Boulevard
Saint Louis, Missouri 63122

ATTN: Ms. Jeanette Garner

Dear Jeanette:

In your letter dated 1 September you requested that I send information stipulating the absence of Asbestos from Zinc Stearate, Aluminum Sulphate and Potassium Tripoly Phosphate. Enclosed are technical data sheets outlining the chemical properties and analysis of these three chemicals. As you will see, Asbestos is not contained in any of them.

If the above raises any questions, or you need additional information, please do not hesitate to contact me. Thank you.

Very truly yours,

THOMPSON-HAYWARD CHEMICAL CO.

Roger Goette

Roger Goette (dl)
Industrial Sales Representative

RG/dl

BON - 03145

Data for Industry

PRODUCT SPECIFICATION

POTASSIUM TRIPOLYPHOSPHATE
TECHNICAL GRADE

FORMULA $K_5P_3O_{10}$ MW 448.4
SYNONYMS Pentapotassium Tripolyphosphate, KTPP
GRADES Powder

CHEMICAL PROPERTIES

	TYPICAL ANALYSIS	SPECIFICATION
P_2O_5, %	46.9	--
Orthophosphate, %	2	3 max
Loss on Ignition	0.4	3 max
Insolubles, %	1	--
pH of 1% solution	9.6	9.3 min, 10.1 max

PHYSICAL PROPERTIES

Solubility at 30°C 198 g per 100 g water
50°C 218 g per 100 g water
Bulk Density, 59 pounds per cubic foot
Particle size, typical, thru no. 20 100%
no. 100 90%

STANDARD CONTAINER

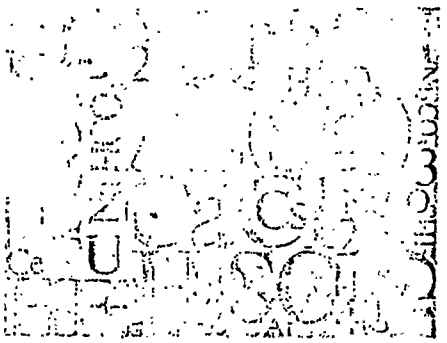
100 pound multi-wall paper bags
400 pound fiber drums

USES

Pigment dispersant in latex emulsion paints, sequestrant in liquid detergents, suspending agent, specialty boiler water compounds.

BON - 03146

FMC Chemicals
633 THIRD AVENUE
NEW YORK, N.Y.10017



Aluminum Sulfate

Characteristics:

Aluminum sulfate (or "alum") is a pale greenish to cream colored (the iron-free grade is colorless) powered, granular or lump amorphous material which dissolves in water to produce a solution with a pH of approximately 3.5 at 1%.

Properties:

Formula	$Al_2(SO_4)_3xH_2O$ (x = approx. 14)
Molecular weight ($14H_2O$ product)	594.36
Solubility	See graph

Method of Manufacture:

Aluminum sulfate is made by reacting bauxite or clay with sulfuric acid. (Purified aluminum hydrate is used to make iron free alum.) The liquor is purified, concentrated and solidified to make the dry product, which is broken up and classified according to particle size.

Grades and Forms:

Commercial grade: powdered, ground, rice and lump

Iron free grade: powdered and ground

Product Markets and Uses:

Market	Use	Reason for use
Clay manufacturers	China clay beneficiation	Flocculates clay slurry
Dyers	Mordant for dyes	Fixes dyes on textile fibers.
Fire extinguisher manufacturers	Fire extinguisher ingredient.	Reacts with bicarbonate to generate foam.
Grease manufacturers	Manufacture of aluminum soaps and greases.	Source of aluminum ion.
Manufacturers of aluminum hydrate and printing inks	Manufacture of aluminum hydrate for lakes and color extenders.	Source of aluminum ion.
Paper mills	Sizing paper.	Fixes rosin size on paper fibers.
Pulp and paper mills	Pitch control agent in pulping and papermaking.	Precipitates pitch and prevents it from building up on machinery.
Sewage and industrial plants	Sewage and industrial waste treatment.	Solids removed by flocculation. Phosphorus removed by chemical precipitation.
Soap manufacturers	Manufacture of glycerin from spent soap lyes.	Reinforces coagulating action of ferric chloride in purifying spent lye.
Tanneries	Tanning furs and white leathers.	Insolublizes collagen without discoloring skin.
Water works, paper mills, swimming pools, oil well operators, manufacturers.	Water treatment	Solids removed by flocculation.
Zeolite and catalyst manufacturers.	Manufacture of zeolites and aluminosilicate catalysts and carriers.	Source of aluminum ion.

Typical Analyses:

Grade	Commercial	Iron free
% Total soluble Al_2O_3	17.1	17.2
% Free Al_2O_3	0.2	0.25
% Total iron (as Fe_2O_3)	0.3	0.002
% Actual Fe_2O_3	0.004	—
% Insoluble in water	0.1	0.01

Packages and Shipping Containers:

Grade	Package	Net Wt.
Commercial	Paper bag	50*, 100 lbs.
	Bulk truck	
	Bulk car	
Iron-free	Paper bag	100 lbs.

* Ground only

Shipments:

Commercial grade FOB Nichols, Ca.
Denver, Colo.
N. Claymont, Del.
E. Point, Ga.
E. St. Louis, Ill.
Marrero, La.
Willow, O.

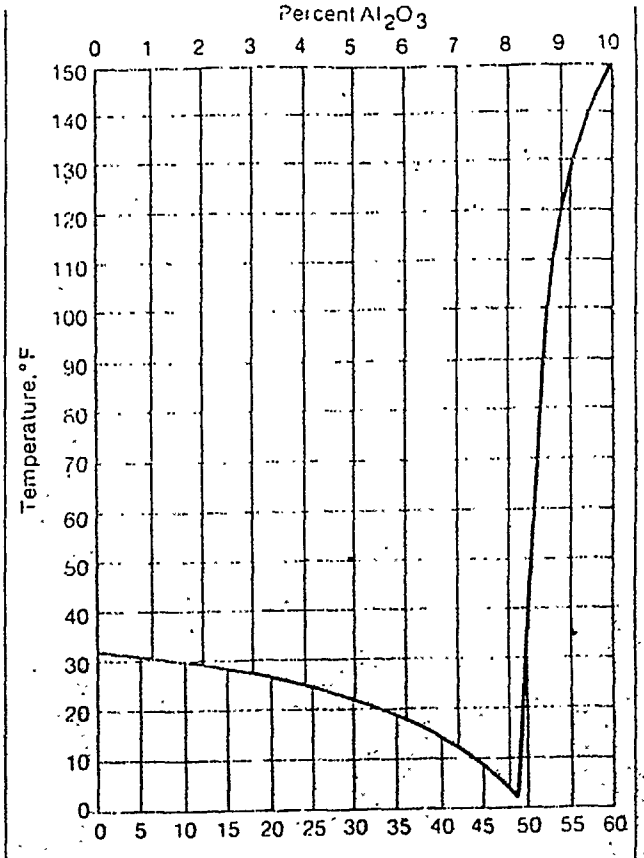
Iron-free grade FOB N. Claymont, Del.
E. Point, Ga.

Shipping Regulations:

None

Additional Information Available:

"Aluminum Sulfate", Bulletin No. 67-01



Solubility of Commercial Dry Aluminum Sulfate
(17% Al_2O_3 in Dry Alum)

Plymouth Metallic Stearates Typical Analyses

Compound	Moisture (%)	Metal as Oxide (%)	Water Soluble Material (%)	Free Fatty Acid (%)	Bulk Density (Fl.oz. 1 lb.)
Aluminum Stearate # 603	1.0	9.8	0.8	4.0	45
Aluminum Stearate # 222-2B	1.2	9.5	0.8	12.5	45
Aluminum Stearate # 351	1.2	6.4	0.4	28.0	40
Aluminum Stearate # 801	0.8	8.8	0.5	4.0	50
Barium Stearate F	0.5	20.7	0.6	2.5	43
Cadium Stearate	1.2	19.0	0.7	0.5	55
Calcium Stearate # 53	2.0	9.4	0.1*	0.2	60
Calcium Stearate D	1.5	9.2	0.2*	3.0	45
Calcium Stearate MK Food Grade**	2.0	9.4	0.1*	0.2	55
Calcium Stearate Food Grade	2.0	9.4	0.1*	0.3	60
Calcium Stearate Food Grade Dense	2.0	9.5	0.1*	1.5	45
Calcium Stearate Fused	1.5	8.9	0.2*	3.0	35
Lithium Stearate #331-10	0.3	5.4	—	0.2	85
Magnesium Stearate USP #2	3.0	7.8	0.3	0.6	75
Magnesium Stearate USP, Food Grade	2.0	7.5	0.3	1.0	45
Magnesium Stearate USP Food Grade VS	2.0	7.7	0.3	0.6	85
Zinc Stearate USP #21	0.5	13.8	0.3	0.3	87
Zinc Stearate USP #220	0.3	13.7	0.3	0.6	87
Zinc Stearate USP #268-1	0.3	13.8	0.2	0.3	87
Zinc Stearate #344-88	0.3	14.2	0.5	1.5	60
Zinc Stearate F	0.7	15.2	0.7	0.4	85
Zinc Stearate HS	0.3	13.8	0.6	0.9	70
Zinc Stearate LS-7	0.8	15.6	0.5	0.8	95
Zinc Stearate XXX-H	1.2	16.3	0.7	1.5	95
Zinc Stearate SI-36	0.5	14.9	0.3	0.2	80
Zinc Stearate SI-50	1.4	17.9	0.5	0.4	80
Zinc Stearate PM	0.3	14.2	0.5	0.5	55
Zinc Stearate USP CEF	0.5	13.8	0.2	0.4	85
Wettable Zinc Stearate U-3	0.5	13.1	—	0.4	80
Wettable Zinc Stearate Z-1	0.5	13.0	—	0.4	80

**Kosher Grade

*As Chlorides

Methods of Analysis

Ash Determination

Weigh accurately approximately one gram of Stearate into an ignited, tared crucible. Ignite very carefully on a hot plate under an infrared lamp or over a low gas flame until all fatty material is consumed. Transfer the crucible to a muffle furnace maintained at 750°C. for one-half hour. Transfer the crucible to a desiccator, cool and weigh.

$$\frac{\text{Weight of Ash}}{\text{Weight of Sample}} \times 100 = \% \text{ Ash}$$

Washed Ash Determination

(Metal as Oxide)

Zinc, Aluminum, Magnesium Stearates

Place the crucible, containing the ash in a 250 ml. beaker. Add approximately 150 ml. of distilled water. Break up the ash with a stirring rod. Cover the beaker with a watch cover glass and boil gently for twenty minutes. Filter and wash the residue. Return the filter paper containing the residue to the original crucible. Carefully burn off the filter paper on a hot plate under an infrared lamp or over a low gas flame. Transfer the crucible to a muffle furnace maintained at 750°C. for one-half hour. Transfer the crucible to a desicator, cool and weigh.

$$\frac{\text{Weight of Washed Ash}}{\text{Weight of Sample}} \times 100 = \% \text{ Washed Ash}$$

Soluble Salts Determination

Zinc, Aluminum, Magnesium Stearates

% Ash − % Washed Ash = % Soluble Salts

Metal as Oxide Determination

Lithium Stearates

Approximately one gram of stearate is weighed out and transferred to a 250 ml. Erlenmeyer flask. Add 50.0 ml. of 0.100 N hydrochloric acid by means of a pipette.

Boil the sample in the 50.0 ml. of hydrochloric acid until the fatty acid is split off. This is complete when a clear melt of the split fatty acid is observed floating on the clear water solution. Maintain a constant volume by adding distilled water as required. Cool the flask until the split fatty acid solidifies, add two drops of phenolphthalein indicator and titrate the excess acid with 0.100 N sodium hydroxide to the pink end-point.

Calculations:

$$\% Li_2O = \frac{(50.0 \text{ ml. HCl} - \text{no. ml. NaOH}) \times 0.100 \times 15 \times 100}{\text{Weight of Sample in Grams} \times 1,000}$$

Metal as Oxide Determination

Calcium Stearates

Boil about 1.2 grams sample, accurately weighed, with 50 ml. of 0.1N hydrochloric acid in a 250 ml. Erlenmeyer flask. Maintain original volume by adding water, if necessary. Boil until the fatty acid layer is clear. Cool, filter, and wash the filter and flask thoroughly with water until the last washing is not acid to litmus. Neutralize the filtrate to litmus with 4.3% sodium hydroxide solution. While stirring, add 15 ml. of 0.1M EDTA (disodium ethylenediaminetetraacetate) from a 50 ml. buret. Add 15 ml. of 4.3% sodium hydroxide and 300 mg. of hydroxy naphthol blue indicator. Continue the titrato a blue end-point. Each ml. of 0.1M EDTA is equivalent to 5.608 mg. of CaO.

Calculations:

$$\%CaO = \frac{(\text{ml. 0.1M EDTA})\ (0.005608)\ (100)}{\text{Weight of sample in grams}}$$

Chloride Determination

Accurately weigh out 10 grams of stearate and transfer to a 400 ml. beaker. Add 150 ml. of distilled water and 40 ml. of concentrated nitric acid.

Heat, with frequent stirring until the fatty acids separate as a clear liquid layer floating on the water solution.

Cool and filter out the solidified fatty acids.

Wash with boiling water until free of chloride.

To the combined filtrate and washings add 10.0 ml. of 0.1N silver nitrate, 2 ml. of nitrobenzene and 2 ml. of ferric ammonium sulfate solution (8 gms. dissolved to make 100 ml. of solution).

Titrate the excess silver nitrate to the first tinge of brown with 0.1N ammonium thiocyanate.

Calculations:

$$\% Cl = \frac{(10.0 - \text{no. ml. } NH_4CNS) \times 0.003546 \times 100}{\text{Weight of Sample in Grams}}$$

Free Fatty Acid Determination

Transfer 2 grams of stearate*, accurately weighed, into a clean, dry 125 ml. Erlenmeyer flask. Add 50 ml. of acetone (N.F. Grade). Attach an air-cooled reflux condenser and boil, gently, on a steam bath for 10 minutes. Cool to room temperature and filter through Whatman #30 paper into a 250 ml. Erlenmeyer flask. Wash the flask, residue and filter with two 25 ml. portions of acetone. Add 10 ml. of water and a few drops of phenolphthalein to the filtrate, and titrate with 0.1N NaOH. Run a blank determination using 100 ml. acetone and 10 ml. water. Each ml. of 0.1N NaOH consumed is equivalent to 0.0284 gm. of fatty acid.

Calculations:

$$\%\text{Free Fatty Acid} = \frac{(\text{ml. 0.1N NaOH} - \text{ml. 0.1N NaOH blank})\ (0.0284)\ (100)}{\text{Weight of sample in grams}}$$

*Note: For stearates with free fatty acid contents above 8.0% use only one gram of stearate.

Moisture Content

We use the Brabender Semi-Automatic Moisture Tester (manufactured by the Brabender Corporation of Rochelle Park, New Jersey) for routine determination of all moisture contents.

This procedure involves drying a ten gram sample in a forced-draft oven maintained at 105°C. for approximately one hour. This instrument has the advantage of reading per cent moisture directly.

Moisture can be determined by a simple loss in weight procedure. For example:

Weigh 2-3 grams of sample into a tared weighing dish and place in an oven maintained at 105°C. for one to two hours. Remove the weighing dish from the oven and place in a desiccator to cool. Weigh the sample when cool.

$$\frac{\text{Loss in Weight}}{\text{Weight of Sample}} \times 100 = \% \text{ Moisture}$$

Melting Point Determination

The capillary method is used to determine the softening point and melting point of metallic soaps.

A melting point capillary tube with one closed end is filled to a height of approximately 5 mm. with sample. The material is shaken down into the end of the capillary tube by gentle tapping. The tube is fastened to the bulb end of an accurate centigrade thermometer by small gum bands. The thermometer, so fixed, is inserted in a Thiele melting-point tube containing glycerine or mineral oil. Heat is applied to the Thiele tube so that the temperature of the heating medium is raised at the rate of 2°C. per min. in the melting range.

The temperature at which the sample shrinks away from the walls of the capillary tube is recorded as the softening point.

The temperature at which the sample becomes clear or liquefies is recorded as the melting point.

NOTE: While the techniques and apparatus used in the melting point determination are commonly employed throughout industry, metallic soaps present certain difficulties.

Most metallic soaps have fairly broad ranges for softening points and melting points. In addition, some metallic soaps, such as calcium and magnesium stearates, do not liquefy. Instead, they shrink to a rod-like mass and become clear. We define this temperature as the melting point. It is sometimes difficult to observe this phenomenon.

Other devices, such as the Fisher-Johns Melting Point Apparatus, can also be used. We find, however, that the softening point is difficult to determine with this instrument.

Arsenic Determination

The procedure for the determination of arsenic in zinc stearate is given in the U.S. Pharmacopeia XVII.

To determine arsenic in calcium stearate, use the same procedure given for the determination of arsenic in magnesium stearate in U.S.P. XVI.

Lead Determination

The procedure for the determination of lead in magnesium stearate and zinc stearate is given in the United States Pharmacopeia XVII.

Lead can be determined in calcium stearate using the same procedure.

Bulk Determination

Our laboratories follow the procedure outlined by the Toilet Goods Association Method 12, requiring a specifically constructed dropping box. The stearate is thoroughly fluffed up, 10 grams weighed out and transferred to a 250 ml. graduate. The graduate is stoppered and dropped 100 times through a height of 2 inches. The height of stearate in the graduate is read in mls. and calculated to fluid ounces per pound, or to pounds per cubic foot.

Calculations:

fl. ozs. per lb. = mls. per gm. × 15.3
lbs. per cu. ft. = 62.4 × gms. per ml.

It should be noted that the measure of apparent density, even when following a prescribed method is, to some extent, manipulative. Consequently, it cannot be expected that published figures by all manufacturers will be comparable on the same basis. When comparing grades, it is well for the prospective user to compare them himself.

Our laboratories have constructed a motor driven instrument which conforms to T.G.A. Method No. 12, but which minimizes the possibility of variation in an operator's technique.

Screen Analysis

A 10 gram sample of stearate is weighed out accurately and transferred to a 400 ml. beaker. Add 300 ml. of "Solox" (U.S.I. proprietary solvent). Carefully mix the stearate in the alcohol to eliminate all lumps.

The wetted stearate is carefully poured in small portions onto a tared 3 inch diameter 325-mesh screen. Wash the screen with "Solox" after each addition of wetted stearate. The screen may be gently tapped with a spatula to decrease the screening time.

Continue until all the wetted stearate has been transferred to the screen.

The residue on the screen may be very gently brushed with a camel's hair brush to break up any agglomerates. The residue is then washed with "Solox" until no stearate passes through the screen.

Place the screen in an oven at 105°C. for one hour. Cool the screen and weigh.

Calculations:

$$\%\text{ retained on 325 mesh screen} = \frac{W - w}{S} \times 100$$

W = Weight of screen plus retained stearate
w = Weight of screen
S = Weight of stearate in grams

NOTE: When determining the screen analysis of calcium stearates, use a 0.4% Aerosol OT solution in water in place of "Solox".