

Chinese Zinc Sulfate Monohydrate testing

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THE ISSUE

- Most if not all Chinese ZSM imports are not all ZSM.
- They are a combination of ZSM and a Non-Water-Soluble compound of zinc.
- As a result, they are violating the Derived From Statement on their label and I believe they are adulterated according to the AAPFCO Model Bill.

THE ISSUE

- Additionally many don't meet their total zinc guarantee as well.
 - A word about zinc analysis and laboratories

THE PROBLEM

- ZSM is a much better, if not the best, inorganic compound for treating zinc deficiencies in soil.
- Westfall, Mortvedt et. al. have proven and long maintained that water solubility is the most important attribute for a zinc micronutrient.
- As a result ZSM commands a higher price per unit of zinc than other less or non-soluble product.

THE PROBLEM

- Current zinc testing methods, use by all states that I'm aware of, don't differentiate between soluble and insoluble products. They check total zinc content.
- The dealer, farmer, lab or the control officials don't know if or how soluble the product is.
- Current method for testing zinc is AOAC 2.111(a) (Prep for total metals in inorganic materials and mixed fertilizers) and then ICP or AA.

THE PROBLEM

- This method uses a strong mineral acid (e.g. HCL) to digest the sample. All compounds of zinc report to the analysis in this method:
 - Soluble
 - Insoluble
 - Available
 - Unavailable
 - They **ALL** report to the zinc content number.

THE PROBLEM

- The Chinese label lists only zinc sulfate monohydrate. But when tested they vary from 75% water soluble to 97%.
- Let's look at the data

THE PROBLEM

Chinese Zinc Sulfate Monohydrate

Location	Label				%	Soluble Value	
	Guarantee	Total	Soluble	Total	Soluble Zn	At \$1,000	
	Zinc	Zinc	Zinc	Discrepancy	Discrepancy	Per Ton	
• Nebraska	35.00%	32.99%	29.72%	5.75%	15.09%	\$150.90	
• Washington	35.00%	32.33%	30.00%	7.63%	14.29%	\$142.86	
• Washington	34.50%	32.38%	31.54%	6.15%	8.58%	\$85.80	
• California	34.00%	34.01%	32.59%	0.00%	4.15%	\$41.47	
• Minnesota	35.00%	32.41%	26.27%	7.40%	24.94%	\$249.43	
• Missouri	35.00%	32.64%	31.30%	6.74%	10.57%	\$105.71	
• Illinois	35.00%	34.18%	28.86%	2.34%	17.54%	\$175.43	
• Washington	34.50%	33.02%	30.91%	4.29%	10.40%	\$104.05	
•							
• California	35.00%	33.02%	30.91%	5.66%	11.69%	\$116.90	
• Nebraska	35.50%	36.62%	35.99%	0%	0%	\$0	
• Nebraska	35.00%	33.53%	28.44%	4.20%	18.75%	\$187.50	
• Nebraska	35.00%	33.63%	28.94%	3.92%	17.32%	\$173.20	
•							
• Nebraska	35.00%	31.96%	30.43	8.75%	13.06%	\$130.60	
• Nebraska	35.00%	32.83%	30.33	6.20%	13.55%	\$135.50	
• Nebraska	35.00%	33.62%	30.20%	3.95%	13.72%	\$137.20	
• Nebraska	35.00%	33.53%	29.10%	4.20%	16.86%	\$168.90	
• Minnesota	35.50%	35.22%	34.85%	0.80%	1.83%	\$18.30	

ALS LAB RESULTS

Sample Name	Label Zinc Guarantee	ALS Lab Code	Total Zinc	Water Soluble Zinc	Soluble Zn Discrepancy from Guarantee	Value of difference at \$1000/ton product cost
Washington	35.50%	K1508187-001	33.9	31.0	12.7%	\$127.00
Washington	34.50%	K1508187-002	34.8	33.0	4.4%	\$44.00
California	34%	K1508187-003	36.7	33.8	0.6%	\$6.00
Minnesota	34%	K1508187-004	33.2	26.4	22.4%	\$224.00
Missouri	35%	K1508187-005	36.4	32.2	8.0%	\$80.00
Illinois	35%	K1508187-006	35.8	28.4	18.9%	189.00
Washington	34.50%	K1508187-007	35.4	31.6	8.4%	\$84.00

THE PROBLEM

PRODUCT: ZINC SULFATE MOMO 35% FINES
 Product #:1176-0033

GUARANTEED ANALYSIS	(%)	REPORTED METALS	(ppm)
Total Nitrogen (N)		Arsenic	0.2500
Available Phosphoric Acid (P ₂ O ₅)		Cadmium	1.5600
Soluble Potash (K ₂ O)		Cobalt	4.6000
Calcium (Ca)		Mercury	0.5000
Magnesium (Mg)		Molybdenum	0.1000
Sulfur (S)	17.0000	Nickel	28.5000
Boron (B)		Lead	0.5000
Chlorine (Cl)		Selenium	0.5000
Cobalt (Co)		Zinc	377600.0000
Copper (Cu)		The symbol "<" indicates that the metal was NOT FOUND at or above the minimum detection limit.	
Iron (Fe)			
Manganese (Mn)		Waste-Derived? Micronutrient Fertilizer?	
Molybdenum (Mo)			
Sodium (Na)		35.0000	
Zinc (Zn)			
GYPSUM & LIMING MATERIALS	(%)	(%)	
Calcium Carbonate (CaCO ₃)		Magnesium Carbonate (MgCO ₃)	
Calcium Carbonate Equivalent (CaCO ₃)		Calcium Sulfate (CaSO ₄ ·2H ₂ O)	

THE PROBLEM

PRODUCT: ZINC SULFATE MONOHYDRATE
Product #:2354-0001

GUARANTEED ANALYSIS	(%)	REPORTED METALS	(ppm)
Total Nitrogen (N)		Arsenic	8.5100
Available Phosphoric Acid (P ₂ O ₅)		Cadmium	3.1400
Soluble Potash (K ₂ O)		Cobalt	2.7200
Calcium (Ca)		Mercury	<0.0050
Magnesium (Mg)		Molybdenum	307.0000
Sulfur (S)	17.5000	Nickel	4.2600
Boron (B)		Lead	8.5100
Chlorine (Cl)		Selenium	8.5100
Cobalt (Co)		Zinc	337000.0000
Copper (Cu)		The symbol "<" indicates that the metal was NOT FOUND at or above the minimum detection limit.	
Iron (Fe)			
Manganese (Mn)			
Molybdenum (Mo)		Waste-Derived?	
Sodium (Na)		Micronutrient Fertilizer?	
Zinc (Zn)	35.0000		
GYPSUM & LIMING MATERIALS	(%)	(%)	
Calcium Carbonate (CaCO ₃)		Magnesium Carbonate (MgCO ₃)	
Calcium Carbonate Equivalent (CaCO ₃)		Calcium Sulfate (CaSO ₄ ·2H ₂ O)	

THE PROBLEM

PRODUCT: ZINC SULFATE MONOHYDRATE GRANULAR 34.5% ZN
 Product #:1815-0013

GUARANTEED ANALYSIS		(%)	REPORTED METALS	(ppm)
Total Nitrogen (N)			Arsenic	1.0000
Available Phosphoric Acid (P ₂ O ₅)			Cadmium	1.8300
Soluble Potash (K ₂ O)			Cobalt	251.0000
Calcium (Ca)			Mercury	0.0187
Magnesium (Mg)			Molybdenum	36.5000
Sulfur (S)		18.0000	Nickel	459.0000
Boron (B)			Lead	1.0000
Chlorine (Cl)			Selenium	1.0000
Cobalt (Co)			Zinc	364000.0000
Copper (Cu)			The symbol "<" indicates that the metal was NOT FOUND at or above the minimum detection limit.	
Iron (Fe)				
Manganese (Mn)				
Molybdenum (Mo)			Waste-Derived?	
Sodium (Na)			Micronutrient Fertilizer?	
Zinc (Zn)		34.5000		
GYPSUM & LIMING MATERIALS		(%)		(%)
Calcium Carbonate (CaCO ₃)			Magnesium Carbonate (MgCO ₃)	
Calcium Carbonate Equivalent (CaCO ₃)				

THE PROBLEM

PRODUCT: ZINC SULFATE MONOHYDRATE GRANULAR 35% ZN
 Product #:1815-0012

GUARANTEED ANALYSIS	(%)	REPORTED METALS	(ppm)
Total Nitrogen (N)		Arsenic	25.0000
Available Phosphoric Acid (P ₂ O ₅)		Cadmium	10.0000
Soluble Potash (K ₂ O)		Cobalt	300.0000
Calcium (Ca)		Mercury	3.0000
Magnesium (Mg)		Molybdenum	50.0000
Sulfur (S)	18.0000	Nickel	500.0000
Boron (B)		Lead	10.0000
Chlorine (Cl)		Selenium	10.0000
Cobalt (Co)		Zinc	400000.0000
Copper (Cu)		The symbol "<" indicates that the metal was NOT FOUND at or above the minimum detection limit.	
Iron (Fe)			
Manganese (Mn)			
Molybdenum (Mo)		Waste-Derived?	
Sodium (Na)		Micronutrient Fertilizer?	
Zinc (Zn)	35.0000		
GYPSUM & LIMING MATERIALS	(%)	(%)	
Calcium Carbonate (CaCO ₃)		Magnesium Carbonate (MgCO ₃)	
Calcium Carbonate Equivalent (CaCO ₃)		Calcium Sulfate (CaSO ₄ ·2H ₂ O)	

THE PROBLEM

PRODUCT: ZINC SULPHATE MONOHYDRATE
 GRANULAR 2-4 MM
 Product #:2797-0001

GUARANTEED ANALYSIS	(%)	REPORTED METALS	(ppm)
Total Nitrogen (N)		Arsenic	0.2500
Available Phosphoric Acid (P ₂ O ₅)		Cadmium	3.1400
Soluble Potash (K ₂ O)		Cobalt	4.5000
Calcium (Ca)		Mercury	0.0500
Magnesium (Mg)		Molybdenum	0.5000
Sulfur (S)	26.0000	Nickel	56.7000
Boron (B)		Lead	0.8000
Chlorine (Cl)		Selenium	0.5000
Cobalt (Co)		Zinc	362650.0000
Copper (Cu)		The symbol "<" indicates that the metal was NOT FOUND at or above the minimum detection limit.	
Iron (Fe)			
Manganese (Mn)			
Molybdenum (Mo)		Waste-Derived?	
Sodium (Na)		Micronutrient Fertilizer?	
Zinc (Zn)	34.0000		
GYPSUM & LIMING MATERIALS	(%)	(%)	
Calcium Carbonate (CaCO ₃)		Magnesium Carbonate (MgCO ₃)	
Calcium Carbonate Equivalent (CaCO ₃)		Calcium Sulfate (CaSO ₄ ·2H ₂ O)	

THE PROBLEM

PRODUCT: MAXIMO 360 ZINC SULFATE-POWDER WITH SULFUR
 Product #:0872-0006

GUARANTEED ANALYSIS		REPORTED METALS
	(%)	(ppm)
Total Nitrogen (N)		Arsenic <4.6000
Available Phosphoric Acid (P ₂ O ₅)		Cadmium 52.1000
Soluble Potash (K ₂ O)		Cobalt 5.0000
Calcium (Ca)		Mercury <0.1000
Magnesium (Mg)		Molybdenum <3.5000
Sulfur (S)	17.5000	Nickel 8.4000
Boron (B)		Lead 25.0000
Chlorine (Cl)		Selenium 9.0000
Cobalt (Co)		Zinc 374000.0000
Copper (Cu)		The symbol "<" indicates that the metal was NOT FOUND at or above the minimum detection limit.
Iron (Fe)		
Manganese (Mn)		Waste-Derived? Micronutrient Fertilizer?
Molybdenum (Mo)		
Sodium (Na)		
Zinc (Zn)	35.5000	
GYPSUM & LIMING MATERIALS		
	(%)	(%)
Calcium Carbonate (CaCO ₃)		Magnesium Carbonate (MgCO ₃)
Calcium Carbonate Equivalent (CaCO ₃)		Calcium Sulfate (CaSO ₄ ·2H ₂ O)

THE SOLUTION

- With this data, I am representing the three manufacturers of ZSM in N. America, and we're asking you to confirm our data.
- If it's confirmed, there has to be two AOAC methods determined by the Derived Statement on the label.
 - Derived solely from water-soluble compounds e.g. zinc sulfate , zinc chloride use AOAC 2.111(e)(1) (aqueous extraction for zinc and iron) ALS and Kronos used this method.
 - Derived from a combination of water-soluble and in-soluble compounds AOAC 2.111(a).
- We realize this could result in a request for a BIG CHANGE for AAPFCO. Without it the farmers won't be getting what they are paying for.
- Can AAPFCO put together a program to confirm our data to prove the necessity of this suggested change?

THE SOLUTION

- Thank you
- Questions / Discussion