PETITION FOR LISTING
ON
NATIONAL LIST OF APPROVED AND PROHIBITED
SUBSTANCES
SEC. 2118. [7 U.S.C. 6517] NATIONAL LIST

Petitioner name: Aquaculture Working Group, % George S. Lockwood, Chair
Address: PO Box 345
Carmel Valley, CA 93924

Telephone number: 831-659-4145
Email address: GeorgeSLockwood@aol.com

Date of petition: June 7, 2012

Check applicable:

X § 205.609 Synthetic substances allowed for use in organic aquatic *plant* production.

○ § 205.610 Nonsynthetic substances prohibited for use in organic aquatic *plant* production

○ § 205.611 Synthetic substances allowed for use in organic aquatic *animal* production.

○ § 205.612 Nonsynthetic substances prohibited for use in organic aquatic *animal* production.

Send to: National List Coordinator, National Organic Program,
USDA/AMS/TM/ NOP, Room 2646–So., Ag Stop 0268,
1400 Independence Ave., SW.,
Washington, DC 20250-0268.

Summary of request:

Previous actions by NOSB and NOP allow micronutrients in the organic production of crops under:

> "§ 205.601 Synthetic substances allowed for use in organic crop production
> (j) As plant or soil amendments
> (6) Micronutrients—not to be used as a defoliant, herbicide, or desiccant. Those made from nitrates or chlorides are not allowed. Soil deficiency must be documented by testing."

This petition is a request for NOSB and NOP to allow micronutrients in the organic production of aquatic plants in:

> "§ 205.609 Synthetic substances allowed in organic aquatic plant production
> (*x*) Micronutrients."

For many years, micronutrients have been allowed for an identical use in terrestrial organic plant production in § 205.601 with certain limitations. These limitations are not applicable to aquaculture. In cases of nitrates or chlorides, the levels of application are so low as to have no consequences. For example, with the growth of marine plants, substantial amounts of chloride already exist in growth media. Testing of soil is inappropriate. Accurate testing of water media for micronutrients at the levels of application is either impossible or unreasonably costly. Essential micronutrients must be included in growth media at the outset of culture in amounts adequate to enable growth.

In this petition, the word micronutrient is used interchangeably with trace element, trace metal, and trace mineral. This is a class of elements when dissolved in water in very small amounts that are essential for the growth and health of aquatic plants.

1. The substance's chemical or material common names.

Micronutrients including, but not limited to the following partial list[1]:

Iron	Ferric chloride	$FeCl_3 6 \cdot H_2O$
Copper	Copper sulfate	$CuSO_4 \cdot 5H_2O$
Zinc	Zinc sulfate	$ZnSO_4 \cdot 7H_2O$
Cobalt	Cobalt chloride	$CoCl_2 \cdot 6H_2O$
Manganese	Manganese chloride	$MnCl_2 \cdot 4H_2O$
Molybdenum	Sodium molybdate	$Na_2MoO_4 \cdot 2H_2O$

These micronutrients contained in the standard Guillard f/2 media apply to a wide range of culture media made with water with a wide variation of trace mineral concentrations. It is impossible or impractical to directly measure these low concentrations in water in most cases.

Before the development of such standard media, it was common practice to add aqueous extracts of soil to algae culture media. Such undefined soil extracts contained many trace elements to supplement those trace elements in the water used to make the culture media. With the development of the Guillard f/2 and other defined media, the use of soil extracts became unnecessary.

Sodium and chloride salts are used for production of aquatic plants since they are not toxic in aquatic systems at the levels used. This differs from terrestrial crops where these substances can be toxic.

This is a partial list because deficiencies of one or more additional micronutrients may develop depending upon the source of growing water and the species of aquatic plant in culture. Growing media, whether with fresh, brackish or full salinity ocean water, vary substantially in their trace element composition depend-

[1] These trace elements are widely used in seawater media for culturing algae, including in the Guillard f/2 Medium. For further information please see "Algal Medium Recipes" at : https://ncma.bigelow.org/node/83 .

ing upon location and other factors. The requirements of specific species also vary substantially.

It is important to note that a deficiency of any essential micronutrient will adversely affect the growth and health of algae, often resulting in the loss of the entire culture.

2. The manufacturer's or producer's name, address and telephone number and other contact information of the manufacturer/producer of the substance listed in the petition.

There are many suppliers of trace minerals and trace mineral premixes, including but not limited to DSM Nutritional Products (formerly Roche). There are no micronutrients specifically manufactured for use in aquaculture.

Micronutrients for aquatic plants contain many of the same trace minerals as are necessary for the production of terrestrial crops. Some of the same minerals are necessary for growing organic aquatic plants as are now used in organic micronutrients for crops. Please see the letter in Exhibit 2 for further information.

As for specific information on the manufacturers of the ingredients in trace mineral, as stated in Exhibit 2, we are informed that various trace minerals are obtained from sources in a number of countries, including China. Manufacturing processes are proprietary.

Please see Exhibit 3 for labels for some micronutrients used to culture aquatic plants.

3. The intended or current use of the substance such as use as a pesticide, animal feed additive, processing aid, nonagricultural ingredient, sanitizer or disinfectant. If the substance is an agricultural ingredient, the petition must provide a list of the types of product(s) (*e.g.*, cereals, salad dressings) for which the substance will be used and a description of the substance's function in the product(s) (*e.g.*, ingredient, flavoring agent, emulsifier, processing aid).

Plant cultures and their media are contained, as in on-shore tanks and ponds, and are therefore not in contact with soil.

4. A list of the crop, livestock or handling activities for which the substance will be used. If used for crops or livestock, the substance's rate and method of application must be described. If used for handling (including processing), the substance's mode of action must be described.

In aquaculture, there are a wide range of aquatic plants, from microscopic microalgae to large kelp macroalgae, that are grown under different conditions.

Micronutrients listed for Guillard f/2 media are dissolved in aqueous growing media for aquatic plants in very dilute solutions as follows:

Micronutrient	Part per billion of trace element
$FeCl_3 * 6H_2O$	650.5

$CuSO_4 * 5H_2O$	4.8
$Na_2MoO_4 * 2H_2O$	2.5
$ZnSO4 * 7H_2O$	5.0
$CoCl_2 * 6H_2O$	2.5
$MnCl_2 * 4H_2O$	50.0

These concentrations of micronutrients are very low, and in most cases below economic detection levels once dissolved in the aqueous growth media.

Nutrients in algae culture, including micronutrients, are usually added to the culture media at the outset, and may be supplemented from time to time. Testing of dissolved dissociated ionic forms of micronutrients at very low concentrations, other than ferric ions, is extremely difficult or prohibitively expensive.

One method of monitoring depletion is to test for a sentinel element, such as ferric ions, and when ferric ion levels decrease to a certain action level, then to supplement the culture media with the entire micronutrient mix. Another method is to test plant biomass for these micronutrients that become concentrated in the biomass, where possible, and supplement the deficient micronutrients if necessary.

Growing media containing micronutrients that may be released into the environment would have a positive impact. There are no known harmful environmental impacts from micronutrients at these very low levels. None are known to be toxic at these very low levels. Any residual trace minerals released into the environment will be at extremely low concentrations below any physiologically significant level, and will be rapidly absorbed by microorganisms.

5. The source of the substance and a detailed description of its manufacturing or processing procedures from the basic component(s) to the final product. Petitioners with concerns for confidential business information may follow the guidelines in the Instructions for Submitting CBI listed in #13.

Micronutrients are obtained from sources in a number of countries, including China. Manufacturing processes are proprietary. Please see letter from DSM Nutritional Products in Exhibit 2.

6. A summary of any available previous reviews by State or private certification programs or other organizations of the petitioned substance. If this information is not available, the petitioner should state so in the petition.

In the Final Rule for Crops, under "§ 205.601 Synthetic substances allowed for use in organic crop production (j) As plant or soil amendments (6) Micronutrients—not to be used as a defoliant, herbicide, or desiccant. Those made from nitrates or chlorides are not allowed. Soil deficiency must be documented by testing."

Organic Materials Review Institute (OMRI)
Micronutrients – synthetic
Status: Allowed with Restrictions

Class: Crop Fertilizers and Soil Amendments
Origin: Synthetic
Description:
Use restricted to cases where soil/plant nutrient deficiency is documented by soil or tissue testing. Micronutrients include: boron, cobalt, copper, iron, manganese, molybdenum, selenium, and zinc. Carriers, fillers, chelating agents, and complexing agents must either be nonsynthetic, or must be on the list of allowed synthetics. See other MICRONUTRIENTS – SYNTHETIC listings, and TRACE MINERALS – NON-SYNTHETIC.
NOP Rule: 205.601(j)(6) As plant or soil amendments… Micronutrients—not to be used as a defoliant, herbicide, or desiccant. Those made from nitrates or chlorides are not allowed. Soil deficiency must be documented by testing. (i) Soluble boron products (ii) Sulfates, carbonates, oxides, or silicates of zinc, copper, iron, manganese, molybdenum, selenium, and cobalt.

7. Information regarding EPA, FDA, and State regulatory authority registrations, including registration numbers. If this information does not exist, the petitioner should state so in the petition.

There are no EPA, FDA or State regulations governing the use of micronutrients for production of aquatic plants.

There are few international organizations with organic aquaculture standards, particularly aquatic plant standards. It appears that some await the lead of USDA in placing the 2009 recommendations of NOSB into the Final Rule.

Canadian draft aquaculture standards consider trace minerals used in aquaculture the same as trace minerals used in livestock and provide:

> Minerals, Trace Minerals, Elements - Non-synthetic chelated or sulphated minerals such as but not limited to calcium chloride. Synthetic nutrient minerals may be used when non-synthetic sources are not commercially available. Minerals may not be used to stimulate growth or production.

In the United Kingdom, Soil Association Organic Standards June 2011 include standards for finfish and shellfish, but do not include aquatic plants.

In the recent EC standards trace minerals and vitamins in aquatic plant production appear to be unregulated.

8. The Chemical Abstract Service (CAS) number or other product numbers of the substance and labels of products that contains the petitioned substance. If the substance does not have an assigned product number, the petitioner should state so in the petition.

		CAS number
Ferric chloride	$FeCl_3 \cdot 6H_2O$	7705-08-0
Copper sulfate	$CuSO_4 \cdot 5H_2O$	7758-98-7
Zinc sulfate	$ZnSO_4 \cdot 7H_2O$	7733-02-0
Cobalt chloride	$CoCl_2 \cdot 6H_2O$	7646-79-9
Manganese chloride	$MnCl_2 \cdot 4H_2O$	7773-01-5
Sodium molybdate	$Na_2MoO_4 \cdot 2H_2O$	7631-95-0

Please see Exhibit 1 for Trace Mineral References from Organic Materials Review Institute (OMRI). These references are examples only, and do not include all trace minerals that may be necessary for aquatic plants.

9. The substance's physical properties and chemical mode of action including (a) Chemical interactions with other substances, especially substances used in organic production; (b) toxicity and environmental persistence; (c) environmental impacts from its use and/ or manufacture; (d) effects on human health; and, (e) effects on soil organisms, crops, or livestock.

Some of the micronutrient salts are chlorides. In terrestrial agriculture chlorides are avoided to avoid the buildup of salts that are toxic to crops. This is not the case with aquaculture since most water sources, including marine, brackish and fresh water contain much larger amounts of chloride salts than would be added by these nutrients at the very low levels employed.

10. Safety information about the substance including a Material Safety Data Sheet (MSDS) and a substance report from the National Institute of Environmental Health Studies. If this information does not exist, the petitioner should state so in the petition.

		MSDS
Ferric chloride	$FeCl_3 \cdot 6H_2O$	ICSC:1499
http://www.inchem.org/documents/icsc/icsc/eics1499.htm		
Copper sulfate	$CuSO_4 \cdot 5H_2O$	C5918
http://hazard.com/msds/mf/baker/baker/files/c5918.htm		
Zinc sulfate	$ZnSO_4 \cdot 7H_2O$	ICSC:1698
http://www.inchem.org/documents/icsc/icsc/eics1698.htm		
Cobalt chloride	$CoCl_2 \cdot 6H_2O$	ICSC:0783
http://www.inchem.org/documents/icsc/icsc/eics0783.htm		
Manganese chloride	$MnCl_2 \cdot 4H_2O$	N/A
http://www.sciencelab.com/msds.php?msdsId=9924583		
Sodium molybdate	$Na_2MoO_4 \cdot 2H_2O$	N/A
http://www.sciencelab.com/msds.php?msdsId=9925011		

11. Research information about the substance which includes comprehensive substance research reviews and research bibliographies, including reviews and bibliographies which present contrasting positions to those presented by the petitioner in supporting the substance's inclusion on or removal from the National List. For petitions to include non-organic agricultural substances onto the National List, this information item should include research concerning why the substance should be permitted in the production or handling of an organic product, including the availability of organic alternatives. Commercial availability does not depend upon geographic location or local market conditions. If research information does not exist for the petitioned substance, the petitioner should state so in the petition.

As indicated in answers to the prior questions the science of the availability and role of trace elements in the healthy growth of aquatic plants is not as advanced as it is in soil-based agriculture. This is largely due to the very difficult nature of measuring these elements at concentrations of parts per billion in water.

What is known is that the addition of certain trace elements as specified in the Guillard f/2 medium, and other similar defined media, provides the necessary micronutrients for healthy plant growth in most cases. In a some few cases, it may be necessary to supplement additional trace elements.

In some cases it is possible to estimate pending deficiencies by monitoring sentinel minerals that can be readily measured, such as iron. In other cases, it is possible to detect deficiencies by analysis of certain micronutrients in the biomass of the plants in culture.

The two leading papers that develop the necessity of micronutrients for aquatic plants are:

Provasoli, L., J. J. A. McLaughlin and M. R. Droop (1957)
The Development of Artificial Media for Marine Algae
Biomedical and Life Sciences, Archives of Microbiology
Volume 25, Number 4, 392-428, DOI: 10.1007/BF00446694

Guillard, R.L. 1975. Culture of phytoplankton for feeding marine invertebrates, p. 29 - 60. In: P.B. Smith (ed) Culture of Marine Invertebrates. Plenum Press, New York.

Further information on the essentiality of micronutrients in algae culture is available at:

The Provasoli-Guillard National Center for Marine Algae and Microbiota (NCMA) https://ncma.bigelow.org/

Other papers on this subject include:

Andersen, Robert, 2005. Algal Culturing Techniques, Academic Press 596 Pages ISBN-13: 9780120884261 [Andersen is the retired director of NCMA referenced above.]

Dupuy, J.L., N.T. Windsor and C.E. Sutton. 1977. Manual for Design and Operation of an Oyster Seed Hatchery for the American Oyster, Special Report No. 142 in Applied Marine Science and Ocean Engineering of the Virginia Institute of Marine Science, Gloucester Point, Virginia.

Morel, F. M. M., J. G. Rueter, Donald M. Anderson, R. R. L. Guillard, Aquil: A Chemically Defined Phytoplankton Culture Medium for Trace Metal Studies, Journal of Phycology Volume 15, Issue 2, pages 135–141, June 1979

Price, N.M., G I Harrison, J G Hering, R J Hudson, P M V Nirel, B Palenik, F M M Morel. Preparation and chemistry of the artificial algal culture medium Aquil. Biological Oceanography (1989) Volume: 6, Issue: 5-6, Pages: 443-461
http://www.princeton.edu/geosciences/people/morel/pdf/priceBIOLOCEANOG88-89.pdf

Richmond, Amos ed., CRC Handbook of microalgal mass culture, CRC Press, c1986. Boca Raton, Fla., 528 p. : ill. ; 27 cm.

Richmond, Amos ed., Handbook of Microalgal Culture: Biotechnology and Applied Phycology. 2008, John Wiley and Sons

Stein, J.R.. 1973 Handbook of Phycological Methods, Cambridge University Press, Cambridge, England.

United Nations Food and Agriculture Organization
The hatchery culture of bivalves: a practical manual... Part 3 Hatchery operation: culture of algae Table 3**:** Guillard's F/2 media used for culturing algae in bivalve hatcheries from Guillard (1975).
http://www.fao.org/docrep/007/y5720e/y5720e08.htm

There are no contrasting positions regarding the essentiality of micronutrients in the culture of aquatic plants.

12. A ''Petition Justification Statement'' which provides justification for any of the following actions requested in the petition:

A. Inclusion of a Synthetic on the National List, §§ 205.609 and 205.611

• Explain why the synthetic substance is necessary for the production or handling of an organic product.

Micronutrients are essential nutrients for all forms of plant life to maintain normal functions, such as growth, maturation and resistance to disease. Mineral deficiencies resulting from inadequate intake cause well-defined clinical plant diseases and well as general signs of illness including poor growth. Cultures with depleted micronutrients usually die.

It is a well established organic principle that it is preferable to provide healthy living conditions that foster wellness of plants. It is well established that adequate trace mineral intake is essential to the good health of aquatic plants. If micronutrients are not supplemented to growth media, signs of deficiency result, demonstrating that levels of micronutrients are insufficient.

• Describe any non-synthetic substances, synthetic substances on the National List or alternative cultural methods that could be used in place of the petitioned synthetic substance.

There are no known natural alternatives for micronutrients in aquaculture systems. As mentioned above, raw waters used for algae growth media often do not contain sufficient levels of minerals to supply the physiological requirements, making it necessary to supplement growth media to prevent mineral deficiency conditions. Many of the same synthetic trace minerals used in aquaculture are allowed on the National List for organic crops.

• Describe the beneficial effects to the environment, human health, or farm ecosystem from use of the synthetic substance that support its use instead of the use of a non-synthetic substance or alternative cultural methods.

Properly used, these substances are essential for the health of aquatic plants, health of animals that eat these plants, as well as the health of humans who eat these plants and animals.

There are no substitute substances, nor alternative culture methods.

13. A "Confidential Business Information Statement" that describes the specific required information contained in the petition that is considered to be confidential business information or confidential commercial information and the basis for that determination.

This petition does not contain any confidential business information.

Conclusions

Micronutrients are essential for the healthy production of aquatic plants. They are safe, used at very low concentrations, provide no environmental risks at the very low concentrations employed, and there are no natural alternatives.

Previous actions by NOSB and NOP have determined that micronutrients are allowed as plant or soil amendments in crops and are included in the National List for Crops as:

"§ 205.601 Synthetic substances allowed for use in organic crop production

(j) As plant or soil amendments

(6) Micronutrients—not to be used as a defoliant, herbicide, or desiccant. Those made from nitrates or chlorides are not allowed. Soil deficiency must be documented by testing."

This petition is a request for NOSB and NOP to determine that micronutrients qualify for allowance in the culture of aquatic plants as:

"§ 205.609 Synthetic substances allowed in organic aquatic plant production

(*x*) Micronutrients."

This petition seeks a similar allowance for micronutrients for growing aquatic plants as for the allowance of micronutrients in growing crops.

Aquaculture Working Group
George S. Lockwood, Chair

Exhibit 1

Trace Mineral References from Organic Materials Review Institute (OMRI)[2]

Generic Materials: Crop

Boric Acid Allowed with Restrictions

Class: CP Synthetic

May be used as an insecticide for structural pest control provided there is no direct contact with food or crops being certified. Also considered a 'soluble boron product' that may be used for fertility only with a documented boron deficiency. See also BORON PRODUCTS SYNTHETIC.

NOP Rule: *205.601(e)(2) & 205.601(j)(6)(i) As insecticides (including acaricides or mite control)… Structural pest control, no direct contact with organic food or crops. As a plant or soil amendments… Micronutrients… Soil deficiency must be documented by testing… Soluble boron products.*

Cobalt – micronutrient Allowed with Restrictions

Class: CF Synthetic

May be used as a micronutrient. Not to be used as a defoliant, herbicide, or desiccant. Those made from nitrates or chlorides are not allowed. Soil deficiency must be documented by testing. See also MICRONUTRIENTS – SYNTHETIC listings.

NOP Rule: *205.203(d)(5) & 205.601(j)(6)(ii)*

Copper Sulfate Allowed with Restrictions

Class: CF Synthetic

When used as a plant or soil amendment it may be used as a micronutrient fertilizer, but may not be used as a defoliant, herbicide, or desiccant. Soil deficiency of copper must be documented by testing.
See also COPPERS – MICRONUTRIENT.

Copper Sulfate Allowed with Restrictions

Class: CP Synthetic

For use as an algicide in aquatic rice systems with documented need and for tadpole shrimp control in aquatic rice systems; use is not to exceed one application per field during any 24-month period. Application rates are limited to those which do not increase baseline soil test values for copper over a time frame agreed upon by the producer and accredited certifying agent. When used for plant disease control must be used in a manner that minimizes accumulation of copper in the soil. May only be used as an algicide, insecticide, or disease control if the requirements of 205.206(e) are met. When used as a plant or soil amendment it may be used as a micronutrient fertilizer, but may not be used as a defoliant, herbicide, or desiccant. Soil deficiency of copper must be documented by testing.
See also COPPERS – MICRONUTRIENT.

NOP Rule: *205.601(a)(3), 205.601(e)(3), 205.601(i)(2) & 205.601(j)(6)(ii)*

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[2] From OMRI Policy and Standards Manual 2010, Appendix, starting on page 157. AAFCO: Refers to the Association of American Feed Control Officials (AAFCO) *Official Publication* FDA: Food and Drug Administration rules at 21 CFR 582 and 573

Ferric and Ferrous Compounds Allowed with Restrictions

Class: CF, CP Synthetic

Includes ferric oxide, ferric sulfate, and ferrous sulfate. See also IRON PRODUCTS and MICRONUTRIENTS – SYNTHETIC listings.

NOP Rule: *205.601(j)(6)(ii)*

Iron Sulfates Allowed with Restrictions

Class: CF Synthetic

See IRON PRODUCTS.

NOP Rule: *205.601(j)(6)(ii)*

Iron Products Allowed with Restrictions

Class: CF, CP Synthetic

Ferric oxide, ferric sulfate, ferrous sulfate, iron citrate, iron sulfate, or iron tartrate may be used to correct documented deficiencies of iron. See MICRONUTRIENTS – SYNTHETIC listings.

NOP Rule: *205.601(j)(6)(ii) Micronutrients—not to be used as a defoliant, herbicide, or desiccant. Those made from nitrates or chlorides are not allowed. Soil deficiency must be documented by testing. (ii) sulfates, carbonates, oxides, or silicates of zinc, copper, iron, manganese, molybdenum, selenium, and cobalt.*

Sodium Molybdate Allowed with Restrictions

Class: CF Synthetic

To correct documented molybdenum deficiencies. See MICRONUTRIENTS listings.

NOP Rule: *205.105*

Zinc Sulfate

See ZINC PRODUCTS.

Zinc Products Allowed with Restrictions

Class: CF Synthetic

Zinc carbonate, zinc oxide, zinc silicate, and zinc sulfate may be used to correct a documented zinc deficiency. See also MICRONUTRIENTS SYNTHETIC listings.

NOP Rule: *205.601(j)(6)(ii) As plant or soil amendments… Micronutrients— not to be used as a defoliant, herbicide, or desiccant. Those made from nitrates or chlorides are not allowed. Soil deficiency must be documented by testing.*

Exhibit 2

Correspondence from DSM

DSM Nutritional Products

395 Waydom Drive
Ayr, Ontario N0B 1E0
Canada

phone 519-622-2200
fax 519-623-4849

Date
January 5, 2012

phone (519) 624-2789
fax (519) 623-4849
tamara.macdonald@dsm.com

DSM vitamin/mineral mixes for organic animal ag production

To Whom It May Concern:

You have inquired about our vitamin premixes used as feed ingredients in conventional livestock production in the United States, and our vitamin premixes use in organic livestock production. You have also inquired about our vitamins used in aquaculture.

Please be advised that we use the same vitamin and micro-nutrient premixes for conventional livestock that we include in our premixes for aquatic animals. Likewise, our intention is to provide the same vitamins and micro-nutrients for organic aquaculture as we now do for organic livestock use.

You have also requested specific information on the manufacturers of the ingredients in our vitamin and micro-nutrient premixes. Please be informed that we obtain our many vitamins and individual micro-nutrients from a wide range of sources in a number of countries, including China. In most cases, manufacturing processes are proprietary.

We will exercise the same diligence with vitamins and micro-nutrient ingredients for organic aquaculture feeds as we now exercise for organic livestock feeds in compliance with USDA organic production standards.

Kind regards

Tamara M. Macdonald, M.Sc (Agr.)
Nutritional Services Specialist

Exhibit 3

Labels of some microminerals used in aquatic plant culture.

Fax Server 9/30/2009 9:03 PAGE 2/2 Fax Server

CHEM ONE LTD

14140 Westfair East Drive
Phone: 713-896-9966 Fax: 713-896-7540
www.chemone.com sales@chemone.com

$CuSO_4 \cdot 5H_2O$

ITEM: CS2000-50LB Copper Sulfate - Fine 20
REF: 11283-24 DT Certificate of Analysis
MFG BATCH OR LOT #: 11283 Art S-356-8 MFG Sept 14 2009

Certificate Date: 09/28/2009
Receipt Date: 09/29/2009

SYNONYMS: CUPRIC SULFATE
COPPER SULFATE PENTAHYDRATE
APPEARANCE: BLUE CRYSTALS no anticaking agent
COUNTRY OF ORIGIN: MEXICO

CHEMICAL FORMULA: CuSO4.5H2O
CAS NUMBER: 7758-99-8
MOLECULAR WEIGHT: 249.68
PACKAGING: 50 LB PAPER BAG

THE FOLLOWING VALUES HAVE BEEN PROVIDED BY THE MANUFACTURER OF THIS PRODUCT. VERIFIED AND DIGITALLY SIGNED BY CHEM ONE ANALYST. CALL CUSTOMER SERVICE IF YOU HAVE ANY QUESTIONS OR NEED ADDITIONAL INFO. 713-896-9966 M-F 8AM - 5 PM CST.

	Specifications		Typical	Analysis
PURITY	99.0 %	MIN	99.37 - 99.60%	99.51%
COPPER (Cu)	25.2 %	MIN	25.30 - 25.35 %	25.36%
IRON (Fe)	0.1 %	MAX	0.0610 - 0.0846 %	0.0325%
LEAD (Pb)	0.003 %	MAX	0.0020 - 0.0025 %	0.0027%
NICKEL (Ni)	0.004 %	MAX	0.0005 - 0.0009 %	0.0008%
ZINC (Zn)	0.03 %	MAX	0.0146 - 0.0239 %	0.0214%
ALUMINUM (Al)	0.02 %	MAX	0.0019 - 0.0151 %	0.0048%
WATER INSOLUBLES	0.25 %	MAX	0.04 %	0.06%
pH (SOL. 10%)	3.5 - 4.4		3.6 - 4.3	3.72
SCREEN ANALYSIS **	95% THRU US 8	min	99.25 - 99.88 %	99.62%

ADDITIONAL HEAVY METAL DATA, CONC. IN PPM:

As <1 Cd <0.1
Sb <1 Cr 1.0
Bi <0.1 Se <0.5
Ag 0.5 Tl 0.5
Mg 5 Co 0.5
Hg <1
Na 100-200 ppm
Cl, F, Sn, nondetect
FREE MOISTURE: nondetect
BULK DENSITY: 1.1 g/cc

** TYPICAL PARTICLE SIZE

US MESH	% RETAINED
20	28.04 %
24	42.91 %
30	27.09 %
40	16.25%

Po # 2127

THIS PRODUCT IS CERTIFIED TO NSF/ANSI STANDARD 60, MEETS AWWA STANDARDS

.... not for medicinal use.......... .. ..product may cake over time. i.e. 1 year ....

*** PLEASE READ MATERIAL SAFETY DATA SHEET PRIOR TO HANDLING THIS PRODUCT ***
*** FOR CHEMICAL EMERGENCY SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT, CALL ***
*** CHEMTREC DAY / NIGHT (800) 424-9300 or (703) 527-3887 ***

THIS PRODUCT IS NOT TO BE USED IN VIOLATION OF ANY PATENTS. CHEM ONE LTD. DISCLAIMS ANY AND ALL WARRANTIES, EITHER EXPRESSED OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR APPLICATION. IN NO EVENT SHALL CHEM ONE LTD. OR ITS SUPPLIERS BE LIABLE FOR ANY DAMAGES WHATSOEVER INCLUDING DIRECT, INDIRECT, INCIDENTAL, CONSEQUENTIAL, LOSS OF BUSINESS PROFITS OR SPECIAL DAMAGES, EVEN IF CHEM ONE LTD. OR ITS SUPPLIERS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES SO THE FOREGOING LIMITATION MAY NOT APPLY.

DATE CREATED: 09/14/2009 REVISION DATE: 05/06/2009

Copper Sulfate

http://www.chemone.com/default/other/MUP%20Copper%20Sulfate%20Label.pdf

5960 Nash Road, Cape Girardeau, MO 63701
Phone # (800) 666-4706, Fax # (573) 335-2462

CERTIFICATE OF ANALYSIS

Product Name: Ferrous Sulfate Heptahydrate with anti caking agent
Lot Number: 042709

$FeSO_4 \cdot 7H_2O$

Date: April 23, 2009

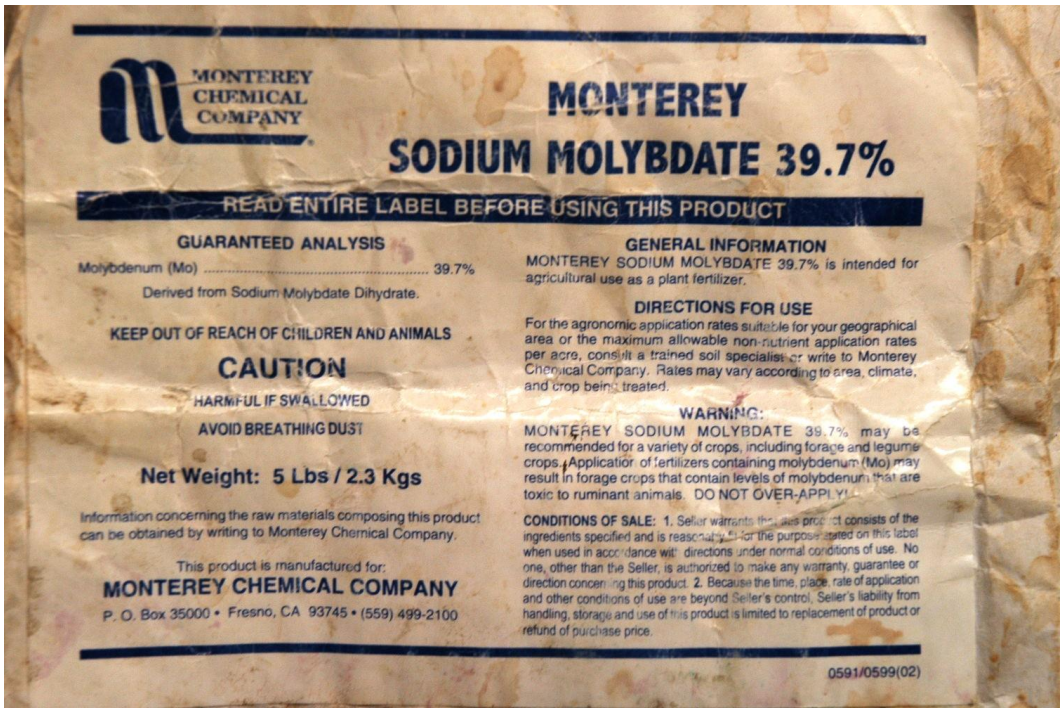
PROPERTY	ANALYSIS	SPECIFICATIONS
Total Iron	20.47%	19.5% to 20.75%
Water Insolubles	.5%	.5% to .%
pH 5% 10% Solution	2.5	2.5 to 3.0

Users should undertake sufficient verification and testing to determine the suitability for their own particular purpose of any information or products referred to herein.

NO WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS MADE.

Quality Control:

Ferrous Sulfate
http://www.qccorporation.com/FSHDry.php



MONTEREY CHEMICAL COMPANY

MONTEREY
SODIUM MOLYBDATE 39.7%

READ ENTIRE LABEL BEFORE USING THIS PRODUCT

GUARANTEED ANALYSIS

Molybdenum (Mo) 39.7%

Derived from Sodium Molybdate Dihydrate.

KEEP OUT OF REACH OF CHILDREN AND ANIMALS

CAUTION

HARMFUL IF SWALLOWED

AVOID BREATHING DUST

Net Weight: 5 Lbs / 2.3 Kgs

Information concerning the raw materials composing this product can be obtained by writing to Monterey Chemical Company.

This product is manufactured for:

MONTEREY CHEMICAL COMPANY

P. O. Box 35000 • Fresno, CA 93745 • (559) 499-2100

GENERAL INFORMATION

MONTEREY SODIUM MOLYBDATE 39.7% is intended for agricultural use as a plant fertilizer.

DIRECTIONS FOR USE

For the agronomic application rates suitable for your geographical area or the maximum allowable non-nutrient application rates per acre, consult a trained soil specialist or write to Monterey Chemical Company. Rates may vary according to area, climate, and crop being treated.

WARNING:

MONTEREY SODIUM MOLYBDATE 39.7% may be recommended for a variety of crops, including forage and legume crops. Application of fertilizers containing molybdenum (Mo) may result in forage crops that contain levels of molybdenum that are toxic to ruminant animals. DO NOT OVER-APPLY!

CONDITIONS OF SALE: 1. Seller warrants that this product consists of the ingredients specified and is reasonably fit for the purpose stated on this label when used in accordance with directions under normal conditions of use. No one, other than the Seller, is authorized to make any warranty, guarantee or direction concerning this product. 2. Because the time, place, rate of application and other conditions of use are beyond Seller's control, Seller's liability from handling, storage and use of this product is limited to replacement of product or refund of purchase price.

0591/0599(02)

http://www.agripacific.com/VendorStuff/MontereyChem/b_product.html **Sodium Molybdate 39.7%**

http://www.agripacific.com/VendorStuff/MontereyChem/label/MonSodMoly39.7_03.pdf

FAIRSKY INDUSTRIAL CO., LIMITED

Tel: +86-312-6793216, +86-312-6793218
Fax: +86-312-3115053
Email: fairskychem@yahoo.com.cn
fairsky.chem@yahoo.com.cn
URL: [illegible]
Add: Room2951, Parkway Court No.9, SwanRoad 56#, Baoding City Hebei China 071000

Certificate Of Analysis
Cobalt Sulfate

$CoSO_4 \cdot 7H_2O$

Contract No. : TS15125(PO.339401)
Inv No : Co-03095
Date : Mar. 15, 2011
FDA No. : 17081299512

	Standard	Testing Result
Co	33% min	33.23
S	17.9% min	15.2
Pb	30ppm max	3ppm
Cd	50ppm max	6ppm
As	30ppm max	4ppm
Hg	20ppm max	6ppm
Ni	200ppm max	16ppm
Sb	20ppm max	4ppm

Batch No.: FS110218
Quantity :3,000KG

For and on behalf of
FAIRSKY INDUSTRIAL CO., LIMITED
....
Authorized Signature(s)

Cobalt Sulfate

http://www.fairskyindustrial.com/ncpdetail.asp?id=12

Zinc Nacional, S.A.

QRA002

CERTIFICATE OF ANALYSIS

REMISION
1409006264

CUSTOMER: MONTEREY AGRESOURCES

PRODUCT: SULFATO ZINC GRAN MAX 362 SACO 50 LB

BOX #: 704883

PURCHASE ORDER: 20061

$ZnSO_4 \cdot 7H_2O$

QUANTITY SHIPPED: 840 SACOS

DATE OF SHIPMENT: 13-Dic-10

LOT	ZINC Zn %	IRON Fe %	CADMIUM Cd %	CHLORINE Cl %
L1034.10	36.90	0.54	0.0019	0.86

LOT	FABRICATED ON:
I1034.10	11/12/10

	LAPSING
I1034.10	11/02/11

HEAD QUALITY CONTROL

[illegible]

Zinc Sulfate

建邦國際集團有限公司
CHEMPONT INTERNATIONAL GROUP LIMITED

香港九龍金馬倫道26-28號金匯商業中心1401室
ROOM1401,CAMBRIDGE HOUSE,26-28 CAMERON ROAD,TSIMSHATSUI,HONG KONG
電話:+852-30658167 傳真:+852-30658167
Tel:+852-30658167 Fax: +852-30658167

$MnSO_4 \cdot H_2O$

Certificate of Analysis

Batch No.: 110518

Contract No.: CPLYLL1132

Commercial Name: Manganese Sulphate Monohydrate

Manufacturering Date: 2011.5.18

Shelf Life: Three years

Appearance: Slightly pink crystal powder

Analysis Result as Follows:

ITEMS	STANDARD	RESULT
$MnSO_4$	98%MIN	98.3%
Mn	31%MIN	31.56%
Pb	0.0020%MAX	0.0011%
Cd	0.0015%MAX	0.0003%
As	0.0005% MAX	0.0003%
Water insoluble	0.05%MAX	0.03%

Test Date: May.18, 2011
Tested By: Li Bingchun

For and on behalf of
CHEMPONT INTERNATIONAL GROUP LIMITED
建邦國際集團有限公司
Authorized Signature(s)

Manganese Sulphate