Scientific Documentation

AC110, Glacial Acetic Acid, USP

Not appropriate for regulatory submission. Please visit www.spectrumchemical.com or contact Tech Services for the most up-to-date information contained in this information package.

Spectrum Chemical Mfg Corp
769 Jersey Avenue
New Brunswick, NJ 08901
Phone 732.214.1300

Ver4.02 12.May.2016

Dear Customer,

Thank you for your interest in Spectrum's quality products and services.

Spectrum has been proudly serving our scientific community for over 45 years. It is our mission to manufacture and distribute fine chemicals and laboratory products with Quality and delivery you can count on every time.

To accomplish our mission, Spectrum utilizes our sourcing leverage and supplier qualification expertise in offering one of the industry's most comprehensive line of fine chemical products under one brand, in packaging configurations designed to meet your research and production requirements. Our product grades include: USP, NF, BP, EP, JP, FCC, ACS, KSA, Reagent grade, as well as DEA controlled substances. We operate facilities in the United States on the East Coast, West Coast, as well as in Shanghai, China in order to provide the best logistical support for our customers.

At Spectrum, Quality is priority number one. Suppliers with the best qualifications are preferred and we employ full-functioning in-house analytical laboratories at each of our facilities. Our facilities and systems are USFDA registered and ISO certified. We frequently host customer audits and cherish opportunities for improvements. Quality is engrained into our culture. Quality is priority number one.

In the following pages, we have designed and prepared documented scientific information to aid you in your initial qualification or your continual use of our products. Please do not hesitate to contact us if further information or the most up-to-date documentation is desired from any of the covered areas.

We appreciate your business and we look forward to hearing from you.

Sincerely,

Alan Wang, MSQA, ASQ CQA
Senior Manager of Technical Services
techservices@spectrumchemical.com

12.May.2016

AC110, Glacial Acetic Acid, USP

Table of Contents

Specification for Glacial Acetic Acid, USP (AC110)

Item Number	AC110
Item	Glacial Acetic Acid, USP
CAS Number	64-19-7
Molecular Formula	$C_2H_4O_2$
Molecular Weight	60.05
MDL Number	
Synonyms	Ethanoic Acid

Test	Specification	
	Min	Max
ASSAY	99.5 - 100.5 %	
CONGEALING TEMPERATURE	15.6 C°	
NONVOLATILE RESIDUE (w/v)		0.005%
CHLORIDE (Cl)		TO PASS TEST
SULFATES (SO_4)		TO PASS TEST
HEAVY METALS		5 ppm
READILY OXIDIZABLE SUBSTANCES		TO PASS TEST
IDENTIFICATION		TO PASS TEST
RETEST DATE		
RESIDUAL SOLVENTS		TO PASS TEST

Spectrum Chemical Mfg Corp

Corporate Headquarters:
769 Jersey Ave.
New Brunswick, NJ 08901
732.214.1300

West Coast Facility:
14422 S. San Pedro St.
Gardena, CA 90248
310.516.8000

SAFETY DATA SHEET

Preparation Date: 5/27/2014 **Revision Date:** 1/27/2016 **Revision Number:** G2

1. IDENTIFICATION

Product identifier

Product code: AC110
Product Name: GLACIAL ACETIC ACID, USP

Other means of identification

Synonyms: Glacial Acetic Acid
CAS #: 64-19-7
RTECS # AF1225000
CI#: Not available

Recommended use of the chemical and restrictions on use

Recommended use: Laboratory reagent.
Uses advised against No information available

Supplier:
Spectrum Chemical Mfg. Corp
14422 South San Pedro St.
Gardena, CA 90248
(310) 516-8000
Order Online At: **https://www.spectrumchemical.com**

Emergency telephone number Chemtrec 1-800-424-9300
Contact Person: Martin LaBenz (West Coast)
Contact Person: Ibad Tirmiz (East Coast)

2. HAZARDS IDENTIFICATION

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute toxicity - Dermal	Category 4
Acute toxicity - Inhalation (Vapors)	Category 4
Skin corrosion/irritation	Category 1Sub-category A
Serious eye damage/eye irritation	Category 1
Flammable liquids	Category 3

Label elements

Danger

Hazard statements
Harmful in contact with skin
Harmful if inhaled
Causes severe skin burns and eye damage
Flammable liquid and vapor

Hazards not otherwise classified (HNOC)
Not Applicable

Other hazards
May be harmful if swallowed
Harmful to aquatic life with long lasting effects
Harmful to aquatic life

Precautionary Statements - Prevention
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Do not breathe dust/fume/gas/mist/vapors/spray
Wash face, hands and any exposed skin thoroughly after handling
Keep away from heat/sparks/open flames/hot surfaces. — No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/ .? /equipment
Use only non-sparking tools
Take precautionary measures against static discharge

Precautionary Statements - Response
Specific measures (see .? on this label)
Immediately call a POISON CENTER or doctor/physician
Specific treatment (see .? on this label)
In case of fire: Use CO_2, dry chemical, or foam to extinguish.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Immediately call a POISON CENTER or doctor/physician.
Call a POISON CENTER or doctor/physician if you feel unwell
Wash contaminated clothing before reuse
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/physician if you feel unwell. Immediately call a POISON CENTER or doctor/physician.
IF SWALLOWED: Rinse mouth. DO NOT induce vomiting

Precautionary Statements - Storage
Store locked up
Store in a well-ventilated place. Keep cool

Precautionary Statements - Disposal
Dispose of contents/container to an approved waste disposal plant

3. COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS-No.	Weight %
Acetic Acid, glacial 64-19-7	64-19-7	100

4. FIRST AID MEASURES

First aid measures

General Advice: Poison information centers in each State capital city can provide additional assistance for scheduled poisons (13 1126). Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves. First aider needs to protect himself.

Skin Contact: Wash off immediately with soap and plenty of water. Continue flushing with plenty of water for at least 15 minutes. Remove all contaminated clothes and shoes. Immediate medical attention is required. Call a physician immediately.

Eye Contact: Flush eyes with water for 15 minutes. Immediate medical attention is required. Call a physician immediately.

Inhalation: Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. WARNING! It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled or ingested material is toxic, infectious or corrosive. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required. Call a physician immediately.

Ingestion: Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. If victim is conscious, give water or milk. Immediate medical attention is required. Call a physician or Poison Control Center immediately.

Most important symptoms and effects, both acute and delayed

Symptoms Severe skin and eye irritation or burns. May cause abdominal pain, nausea, vomiting, diarrhea. Burning sensation in the mouth and stomach. Can burn mouth, throat, and stomach. Thirst. Irritating to respiratory system. May cause bronchitis. May cause build-up of fluid in the lungs (pulmonary edema). Dyspnea (Shortness of breath and difficulty breathing). Coughing and wheezing. Sneezing. May cause central nervous system effects. Convulsions.

Indication of any immediate medical attention and special treatment needed

Notes to Physician: Treat symptomatically

Protection of first-aiders

First-Aid Providers: Avoid exposure to blood or body fluids. Wear gloves and other necessary protective clothing. Dispose of contaminated clothing and equipment as bio-hazardous waste

5. FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: Carbon dioxide (CO2). Dry chemical. Alcohol-resistant foam. Water spray.

Unsuitable Extinguishing Media: Do not use a solid (straight) water stream as it may scatter and spread fire.

Specific hazards arising from the chemical

Hazardous Combustion Products: Carbon monoxide; Carbon dioxide

Specific hazards: Flammable
May be ignited by heat, sparks or flames
Vapor may travel considerable distance to source of ignition and flash back
Vapors may form explosive mixtures with air
Most vapors are heavier than air. They will spread along the ground and collect in low or confined areas (sewers, basements, tanks)
Container explosion may occur under fire conditions or when heated
Fire may produce irritating, corrosive and/or toxic gases

Special Protective Actions for Firefighters

Specific Methods: Water mist may be used to cool closed containers. For larger fires, use water spray or fog. Cool containers with flooding quantities of water until well after fire is out.

Special Protective Equipment for Firefighters: As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal Precautions: Ensure adequate ventilation. Keep people away from and upwind of spill/leak. Avoid contact with skin, eyes and clothing. Use personal protective equipment. Remove all sources of ignition. Pay attention to flashback. Take precautionary measures against static discharges. All equipment used when handling the product must be grounded. Use spark-proof tools and explosion-proof equipment. In case of large spill, water spray or vapor suppressing foam may be used to reduce vapors, but may not prevent ignition in closed spaces.

Environmental precautions Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Prevent entry into waterways, sewers, basements or confined areas. In case of large spill, dike if needed. Dike far ahead of liquid spill for later disposal.

Methods and material for containment and cleaning up

Methods for containment Stop leak if you can do it without risk.

Methods for cleaning up Neutralize with Sodium carbonate or Sodium bicarbonate. Dilute with water. Absorb spill with inert material (e.g. vermiculite, dry sand or earth), then place in a suitable chemical waste container. Clean contaminated surface thoroughly.

7. HANDLING AND STORAGE

Precautions for safe handling

Technical Measures/Precautions:
Provide sufficient air exchange and/or exhaust in work rooms. Remove all sources of ignition. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded. Keep away from incompatible materials.

Safe Handling Advice
Wear personal protective equipment. Use only in well-ventilated areas. Avoid contact with skin, eyes and clothing. Keep away from heat and sources of ignition. Do not breathe vapors or spray mist. Do not ingest. When using do not smoke. Handle in accordance with good industrial hygiene and safety practice.

Conditions for safe storage, including any incompatibilities

Technical Measures/Storage Conditions:
Keep containers tightly closed in a dry, cool and well-ventilated place. Store at room temperature in the original container. Keep away from heat and sources of ignition. Store in a segrated and approved area. Store away from incompatible materials.

Incompatible Materials:
Oxidizing agents. Reducing agents. Metals. Bases. Acids.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

National occupational exposure limits

United States

Components	OSHA	NIOSH	ACGIH	AIHA WHEEL
Acetic Acid, glacial 64-19-7	10 ppm TWA 25 mg/m^3 TWA	10 ppm TWA 25 mg/m^3 TWA 15 ppm STEL 37 mg/m^3 STEL	15 ppm STEL 10 ppm TWA	None

Canada

Components	Alberta	British Columbia	Ontario	Quebec
Acetic Acid, glacial 64-19-7	10 ppm TWA 25 mg/m^3 TWA 15 ppm STEL 37 mg/m^3 STEL	10 ppm TWA 15 ppm STEL	10 ppm TWA 15 ppm STEL	10 ppm TWAEV 25 mg/m^3 TWAEV 15 ppm STEV 37 mg/m^3 STEV

Australia and Mexico

Components	Australia	Mexico
Acetic Acid, glacial 64-19-7	15 ppm STEL 37 mg/m^3 STEL 10 ppm TWA 25 mg/m^3 TWA	10 ppm TWA 25 mg/m^3 TWA 15 ppm STEL 37 mg/m^3 STEL

Appropriate engineering controls

Engineering measures to reduce exposure: Ensure adequate ventilation. Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors and mist below their respective threshold limit value.

Individual protection measures, such as personal protective equipment

Personal Protective Equipment

Eye protection: Face-shield.

Skin and body protection: Chemical resistant protective suit. Gloves. Boots.

Respiratory protection: Vapor respirator. Be sure to use an approved/certified respirator or equivalent.

Hygiene measures: Avoid contact with skin, eyes and clothing. When using, do not eat, drink or smoke. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:
Liquid

Appearance:
No information available

Color:
Clear. Colorless.

Odor:
Pungent. Vinegar-like. Sour.

Taste
Vinegar. Sour.

Formula:
C2-H4-O2

Molecular/Formula weight:
60.05

Flammability:
No information available

Flash point (°C):
39

Flashpoint (°C/°F):
39 °C/102.2 °F
43 °C/109.4 °F

Flash Point Tested according to:
Closed cup
Open cup

Autoignition Temperature (°C/°F):
463 °C/865 °F

Lower Explosion Limit (%):
4%

Upper Explosion Limit (%):
19.9%

pH:
pH of a 1% solution: 2 [Acidic]

Melting point/range(°C/°F):
16.6 °C/619. °F

Boiling point/range(°C/°F):
118.1 °C/244.6 °F

Decomposition temperature(°C/°F):
No information available

Bulk density:
No information available

Density (g/cm3):
No information available

Specific gravity:
1.049

Vapor pressure @ 20°C (kPa):
1.5

Evaporation rate:
No information available

Vapor density:
2.07

VOC content (g/L):
No information available

Odor threshold (ppm):
0.48

Partition coefficient (n-octanol/water):
-0.2

Viscosity:
No information available

Miscibility:
Miscible with alcohol
Miscible with Benzene
Miscible with Carbon tetrachloride
Miscible with Glycerol

Solubility:
Freely soluble in water
Soluble in Acetone
Soluble in Ether
Practically insoluble in Carbon tetrachloride

10. STABILITY AND REACTIVITY

Reactivity

Reacts violently with strong oxidizing agents, acetaldehyde, and acetic anhydride. It can react with metals, strong bases, amines, carbonates, hydroxides, phosphates, many oxides,cyanides, sulfides, chromic acid, nitric acid, hydrogen peroxide, carbonates. ammonium nitrate, ammonium thiosulfate, chlorine trifluoride, chlorosulfonic acid, perchloric acid, permanganates, xylene, oleum, potassium hydroxide, sodium hydroxide, phosphorus isocyanate, ethylenediamine, ethylene imine.
Acetic acid vapors may form explosive mixtures with air.
Reactions between acetic acid and the following materials are potentially explosive: 5-azidotetrazole, bromine pentafluoride, chromium trioxide, hydrogen peroxide, potassium permanganate, sodium peroxide, and phorphorus trichloride. Dilute acetic acid and dilute hydrogen can undergo an exothermic reaction if heated, forming peracetic acid which is explosive at 110 degrees C.
Reaction between chlorine trifluoride and acetic acid is very violent, sometimes explosive.

Chemical stability
Stability: Stable under recommended storage conditions

Possibility of Hazardous Reactions: Hazardous polymerization does not occur

Conditions to avoid: Heat. Ignition sources. Incompatible materials.

Incompatible Materials: Oxidizing agents. Reducing agents. Metals. Bases. Acids.

Hazardous decomposition products: carbon oxides.

Other Information
Corrosivity: Highly corrosive in the presence of stainless steel (304)
Slightly corrosive in presence of aluminum
Non-corrosive in presence of stainless steel (316)
Moderate corrosive effect on bronze

Special Remarks on Corrosivity: No corrosion data on brass

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Principal Routes of Exposure:
Skin. Ingestion. Inhalation. Eyes.

Acute Toxicity

Component Information

Acetic Acid, glacial - 64-19-7
LD50/oral/rat = 3310 mg/kg Oral LD50 Rat
LD50/oral/mouse = 3530 mg/kg
LD50/dermal/rat = No information available
LD50/dermal/rabbit = 1060 µL/kg Dermal LD50Rabbit
LC50/inhalation/rat = 11.4 mg/L Inhalation LC50 Rat 4 h
LC50/inhalation/mouse = 5620 ppm 1 h
Other LD50 or LC50information = No information available

Product Information

LD50/oral/rat =
VALUE- Acute Tox Oral = 3310mg/kg

LD50/oral/mouse =
Value - Acute Tox Oral = 3530mg/kg

LD50/dermal/rabbit
VALUE-Acute Tox Dermal = 1060mg/kg

LD50/dermal/rat
VALUE -Acute Tox Dermal = No information available

LC50/inhalation/rat
VALUE-Vapor = 11.4mg/l (4-hr)
VALUE-Gas = No information available

VALUE-Dust/Mist = No information available

LC50/Inhalation/mouse
VALUE-Vapor = No information available
VALUE - Gas = 5620 ppm 1 hr
VALUE - Dust/Mist = No information available

Symptoms

Skin Contact:	Corrosive. Severe skin irritation. Causes skin burns. Can cause burning pain, inflammation and blisters. Harmful in contact with skin. May be absorbed through the skin in harmful amounts.
Eye Contact:	Severe eye irritation. Causes lacrimation. Causes conjunctivitis. Causes conjunctival irritation. Causes eye burns. Causes corneal damage. May cause blurred vision. May cause permanent injury.
Inhalation	Harmful by inhalation. Causes severe respiratory tract irritation. May cause chemical pneumonitis, bronchitis, and pulmonary edema. Severe exposure may result in lung tissue damage and corrosion (ulceration) of the mucous membranes. Inhalation may also cause rhinitis, sneezing, coughing, oppressive feeling in the chest or chest pain, dyspnea, wheezing, tachypnea, cyanosis, salivation, nausea, giddiness, muscular weakness.
Ingestion	Causes digestive (gastrointestinal) tract irritation. Causes digestive or gastrointestinal tract burns. Symptoms include burning and pain of the mouth, throat, and abdomen, coughing, ulceration, bleeding, nausea, abdomial spasms, vomiting, hematemesis, diarrhea. May cause perforation of the digestive tract. May cause permanent damage of the esophagus and digestive tract. May Also affect the liver (impaired liver function), behavior (convulsions, giddines, muscular weakness), and the urinary system - kidneys (Hematuria, Albuminuria, Nephrosis, acute renal failure, acute tubular necrosis). May also cause dyspnea or asphyxia. May also lead to shock, coma and death. May cause thirst.
Aspiration hazard	No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Chronic Toxicity	Chronic exposure via ingestion may cause blackening or erosion of the teeth and jaw necrosis, pharyngitis, and gastritis. It may also behavior (similar to acute ingestion), and metabolism (weight loss). Chronic exposure via inhalation may cause asthma and/or bronchitis with cough, wheezing, phlegm, and/or shortness of breath . Some researchers consider acetic acid capable of causing a syndrome known as "reactive airways dysfunction." or RADS. This syndrome resembles bronchial asthma, but differs in that exposure to small doses does not cause a reaction a few weeks after onset. It may also affect the blood (decreased leukocyte count), and urinary system (kidneys). Repeated or prolonged skin contact may cause thickening, blackening, and cracking of the skin
Sensitization:	No information available
Mutagenic Effects:	Mutations in microorganisms Experiments with bacteria and/or yeast have shown mutagenic effects Cytogenic analysis - hamster ovary Sister Chromatid Exchange (human lymphocyte)

Carcinogenic effects: Not considered carcinogenic

Components	IARC	ACGIH - Carcinogens	NTP	OSHA HCS - Carcinogens	Australia - Notifiable Carcinogenic Substances	Australia - Prohibited Carcinogenic Substances
Acetic Acid, glacial	Not listed	Not listed	Not listed	Not listed	Not listed	Not listed

Reproductive toxicity No data is available

Reproductive Effects: No information available
Developmental Effects: No information available
Teratogenic Effects: No information available

Specific Target Organ Toxicity

STOT - single exposure No information available
STOT - repeated exposure No information available
Target Organs: Teeth. Respiratory system. Lungs. Skin.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity effects: Aquatic environment.

Acetic Acid, glacial - 64-19-7
Freshwater Fish Species Data: 75 mg/L LC50 Lepomis macrochirus 96 h static 1
79 mg/L LC50 Pimephales promelas 96 h static 1
Water Flea Data: 65 mg/L EC50 Daphnia magna 48 h

Persistence and degradability: No information available

Bioaccumulative potential: No information available

Mobility: No information available

13. DISPOSAL CONSIDERATIONS

Disposal Methods

Waste from residues / unused products:
Waste must be disposed of in accordance with Federal, State and Local regulation.

Contaminated packaging:
Empty containers should be taken for local recycling, recovery or waste disposal

Components	RCRA - F Series Wastes	RCRA - K Series Wastes	RCRA - P Series Wastes	RCRA - U Series Wastes
Acetic Acid, glacial	None	None	None	None

14. TRANSPORT INFORMATION

14. TRANSPORT INFORMATION

DOT

UN-No:	UN2789
Proper Shipping Name:	Acetic acid, glacial
Hazard Class:	8
Subsidiary Risk:	3
Packing Group:	II
ERG No:	132
Marine Pollutant	No data available
DOT RQ (lbs):	No information available
Symbol(s):	R5

TDG (Canada)

UN-No:	UN2789
Proper Shipping Name:	Acetic acid, glacial
Hazard Class:	8
Subsidiary Risk:	3
Packing Group:	II
Description:	No information available

ADR

UN-No:	UN2789
Proper Shipping Name:	Acetic acid, glacial
Hazard Class:	8
Packing Group:	II
Subsidiary Risk:	3
Classification Code:	No information available
Description:	No information available
CEFIC Tremcard No:	No information available

IMO / IMDG

UN-No:	UN2789
Proper Shipping Name:	Acetic acid, glacial
Hazard Class:	8
Subsidiary Risk:	3
Packing Group:	II
Description:	No information available
IMDG Page:	No information available
Marine Pollutant	No information available
EMS:	F-E
MFAG:	No information available
Maximum Quantity:	No information available

RID

UN-No:	UN2789
Proper Shipping Name:	Acetic acid, glacial
Hazard Class:	8
Subsidiary Risk:	8 + 3
Packing Group:	II
Classification Code:	No information available
Description:	No information available

ICAO

UN-No:	UN2789
Proper Shipping Name:	Acetic acid, glacial
Hazard Class:	8

14. TRANSPORT INFORMATION

Subsidiary Risk: 3
Packing Group: II
Description: No information available

IATA

UN-No: UN2789
Proper Shipping Name: Acetic acid, glacial
Hazard Class: 8
Subsidiary Risk: 3
Packing Group: II
ERG Code: 8F
Description: No information available

15. REGULATORY INFORMATION

International Inventories

Components	U.S. TSCA	KOREA KECL	Philippines (PICCS)	Japan ENCS	CHINA	Australia (AICS)	EINECS-No.
Acetic Acid, glacial	Present	Present KE-00013	Present	Present (2)-688	Present	Present	Present 200-580-7

U.S. Regulations

Acetic Acid, glacial

Massachusetts RTK: Present
New Jersey RTK Hazardous Substance List: 0004
New Jersey - Discharge Prevention - List of Hazardous Substances: Present
Pennsylvania RTK: Environmental hazard
Pennsylvania RTK - Environmental Hazard List Present
Minnesota - Hazardous Substance List: Present
New York Release Reporting - List of Hazardous Substances:
5000 lb RQ
100 lb RQ
Louisana Reportable Quantity List for Pollutants: 5000lbfinal RQ
2270kgfinal RQ
California Directors List of Hazardous Substances: Present
FDA - Food Additives Generally Recognized as Safe (GRAS): 21 CFR 184.1005

FDA - 21 CFR - Total Food Additives 133.123 133.124 133.169 133.173 133.178 133.179 172.814 173.370 184.1005 73.85

California Prop. 65: Safe Drinking Water and Toxic Enforcement Act of 1986.

Chemicals Known to the State of California to Cause Cancer:
This product does not contain a chemical requiring a warning under California Prop. 65. (See table below)

Chemicals Known to the State of California to Cause Reproductive Toxicity:
This product does not contain a chemical requiring a warning under California Prop. 65. (See table below)

Components	Carcinogen	Developmental Toxicity	Male Reproductive Toxicity	Female Reproductive Toxicity:
Acetic Acid, glacial	Not Listed	Not Listed	Not Listed	Not Listed

CERCLA/SARA

Components	CERCLA - Hazardous Substances and their Reportable Quantities	Section 302 Extremely Hazardous Substances and TPQs	Section 302 Extremely Hazardous Substances and RQs	Section 313 - Chemical Category	Section 313 - Reporting *de minimis*
Acetic Acid, glacial	5000 lb final RQ 2270 kg final RQ	None	None	None	None

U.S. TSCA

Components	TSCA Section 5(a)2 - Chemicals With Significant New Use Rules (SNURS)	TSCA 8(d) -Health and Safety Reporting
Acetic Acid, glacial	Not Applicable	Not Applicable

Canada

WHMIS hazard class:
B3 Combustible liquid
E Corrosive material

Acetic Acid, glacial

B3 E including 10-80% [Available data does not allow a precise evaluation of the threshold concentration from which solutions meet the B3 criterion], >80%
D2B 3-10%

Canada Controlled Products Regulation:
This product has been classified according to the hazard criteria of the CPR (Controlled Products Regulation) and the MSDS contains all of the information required by the CPR.

Components	WHMIS Ingredient Disclosure List -
Acetic Acid, glacial	1 %

Inventory

Components	Canada (DSL)	Canada (NDSL)
Acetic Acid, glacial	Present	Not Listed

Components	CEPA Schedule I - Toxic Substances	CEPA - 2010 Greenhouse Gases Subject to Manditory Reporting
Acetic Acid, glacial	Not listed	Not listed

EU Classification

R-phrase(s)
R35 - Causes severe burns.
R10 - Flammable.

S -phrase(s)
S23 - Do not breathe gas/fumes/vapor/spray.
S26 - In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S45 - In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 1/2 - Keep locked up and out of the reach of children.

Components	Classification	Concentration Limits:	Safety Phrases
Acetic Acid, glacial	R10 C; R35	10%<=C<25%: Xi; R:36/38 90%<=C: C; R:35 25%<=C<90%: C; R:34	S1/2 S23 S26 S45

The product is classified in accordance with Annex VI to Directive 67/548/EEC

Indication of danger:
C - Corrosive.
Flammable

16. OTHER INFORMATION

Preparation Date: 5/27/2014
Revision Date: 1/27/2016
Prepared by: Sonia Owen

Disclaimer:

All chemicals may pose unknown hazards and should be used with caution. This Safety Data Sheet (SDS) applies only to the material as packaged. If this product is combined with other materials, deteriorates, or becomes contaminated, it may pose hazards not mentioned in this SDS. The physical properties reported in this SDS are obtained from the literature and do not constitute product specifications. Information contained herein does not constitute a warranty, whether expressed or implied, as to the safety, merchantability or fitness of the goods for a particular purpose. Spectrum Chemicals & Laboratory Products, Inc. assumes no responsibility for results obtained or for incidental or consequential damages, including lost profits, arising from the use of these data. No warranty against infringement of any patent, copyright or trademark is made or implied. It shall be the user's responsibility to develop proper methods of handling and personal protection based on the actual conditions of use. While this SDS is based on technical data judged to be reliable, Spectrum assumes no responsibility for the completeness or accuracy of the information contained herein.

End of Safety Data Sheet

Manufacturer

Product Covered: AC110, Glacial Acetic Acid, USP

Spectrum takes ownership as the manufacturer for the Spectrum product listed above and provides full quality assurance, customer service, and technical product support.

While information concerning the raw material manufacturer of our starting materials is considered proprietary, such information can be made available upon request contingent on demonstration of business volume justification and successful execution of confidential disclosure agreement (CDA).

Requests for disclosure of proprietary raw material manufacturer information may be submitted to the assigned account representative for consideration.

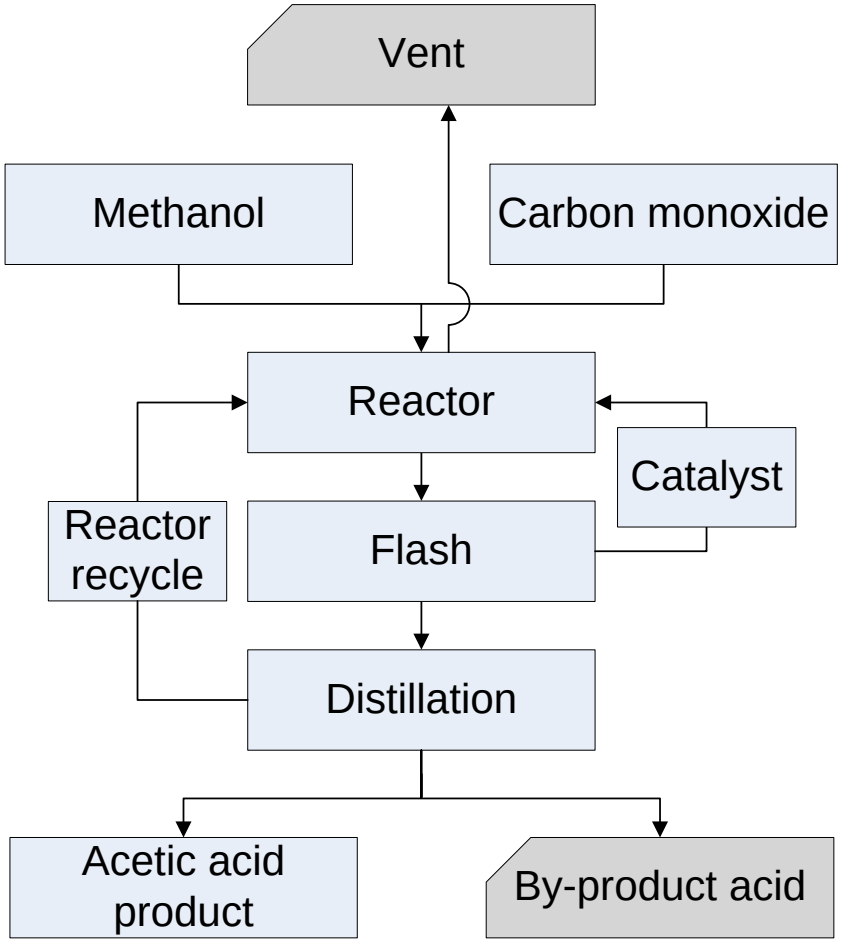
Sincerely,

Alan Wang, MSQA, ASQ CQA
Senior Manager of Technical Services
techservices@spectrumchemical.com

12.May.2016

Manufacturing Process Flowchart

Glacial Acetic Acid, USP - AC110



Spectrum Chemical Mfg Corp

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769 Jersey Ave.
New Brunswick, NJ 08901
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West Coast Facility:
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Certificate of Registration

This is to certify that the quality management system of

Spectrum Chemicals and Laboratory Products, Inc.

Main Site: 14422 South San Pedro Street, Gardena, California, 90248, USA

Additional Sites: 13915 South Main Street, Los Angeles, California, 90061, USA
755 Jersey Avenue, New Brunswick, New Jersey, 08901, USA
769 Jersey Avenue, New Brunswick, New Jersey, 08901, USA
7400 North Oracle Road, Suite 221, Tucson, Arizona, 85704, USA

has been assessed and registered by Intertek as conforming to the requirements of

ISO 9001:2008

The quality management system is applicable to

California and New Jersey sites: The manufacture and distribution of specialty fine chemicals, solutions, equipment, supplies and products for the laboratory, pharmaceutical, food, healthcare, cosmetic, fragrance, biotechnology, environmental and process industries.

Arizona site: Supporting Spectrum's two manufacturing facilitates by: selecting and qualifying distributors of Laboratory and Safety Equipment; processing bids and quotes to generate new sales opportunities; sourcing bulk chemicals in support of bulk bids and quotes; assisting production operations through order expediting and IT infrastructure support.

Certificate Number: 94-316m-01
Initial Certification Date: 27 December 1994
Certificate Issue Date: 29 January 2016
Certificate Expiry Date: 14 September 2018

Calin Moldovean, President
Intertek Testing Services NA, Inc.
900 Chelmsford Street, Suite 301-3, Lowell, MA, USA

ANAB ACCREDITED ISO/IEC 17021 MANAGEMENT SYSTEMS CERTIFICATION BODY

In the issuance of this certificate, Intertek assumes no liability to any party other than to the Client, and then only in accordance with the agreed upon Certification Agreement. This certificate's validity is subject to the organization maintaining their system in accordance with Intertek's requirements for systems certification. Validity may be confirmed via email at certificate.validation@intertek.com or by scanning the code to the right with a smartphone.

The certificate remains the property of Intertek, to whom it must be returned upon request.

CT-ISO 9001-2008-ANAB-EN-LT-L-26.jun.15

Certificate of Registration

This is to certify that the quality management system of

Spectrum China Ltd.

Building A20, No. 3802, Shengang Road, Songjiang District, Shanghai, China

has been assessed and registered by Intertek as conforming to the requirements of

ISO 9001: 2008

The quality management system is applicable to:

Provision of service of purchase, testing and sales for chemical products, repacking of non-hazardous chemical products.

Organization Code:	77762704-8
Certificate Number:	111310001-01
Certificate Issue Date:	17 November 2015
Certificate Expiry Date:	14 September 2018

UKAS MANAGEMENT SYSTEMS
014

Authorised Signature: Calin Moldovean – President, Business Assurance
Intertek Certification Limited, 10A Victory Park, Victory Road, Derby DE24 8ZF, United Kingdom

Intertek Certification Limited is a UKAS accredited body under schedule of accreditation no. 014.

In the issuance of this certificate, Intertek assumes no liability to any party other than to the client, and then only in accordance with the agreed upon Certification Agreement. This certificate's validity is subject to the organization maintaining their system in accordance with Intertek's requirements for systems certification. Validity may be confirmed via email at certificate.validation@intertek.com or by scanning the code to the right with a smartphone.
The annual validity of the certificate can also be checked through the website http://www.cnca.gov.cn of CNCA in China.

The certificate remains the property of Intertek, to whom it must be returned upon request.

March 28, 2016

Certificate of cGMP

Dear Valued Customer:

Spectrum Chemicals and Laboratory Products certify that our USP, NF, FCC, EP, BP, JP, and food grade products are produced, processed, packaged and held in compliance with current Good Manufacturing Practices (cGMP) in accordance with the applicable parts of 21 CFR, parts 210 and 211 of the Code of Federal Regulations.

Spectrum is an FDA registered and inspected drug establishment. Our United States Food and Drug Administration (USFDA) Registration numbers are as follows:

Spectrum-Gardena, CA:	2020632
Spectrum-New Brunswick, NJ:	2246824
Spectrum -Shanghai, China:	3006174778

Thank you for your interest with Spectrum products. Please feel free to contact the Quality Assurance department at 310-516-8000 or via email at qualityassurance@spectrumchemical.com if we may be of further assistance.

Sincerely,

Michelle Weston

Michelle Weston
Quality Assurance Specialist

April 25, 2016

Certificate of cGMP

Dear Valued Customer:

Spectrum Chemicals and Laboratory Products certify that the following product(s) is produced, processed, packaged and held in compliance with current Good Manufacturing Practices (cGMP) in accordance with the applicable parts of 21 CFR, parts 210 and 211 of the Code of Federal Regulations.

Catalog Number	Product Name
AC110	Glacial Acetic Acid, USP

Spectrum is an FDA registered and inspected drug establishment. Our United States Food and Drug Administration (USFDA) Registration numbers are as follows:

Spectrum-Gardena, CA: 2020632
Spectrum-New Brunswick, NJ: 2246824
Spectrum-Shanghai, China: 3006174778

Thank you for your interest with Spectrum products. Please feel free to contact the Quality Assurance department at 310-516-8000 or via email at qualityassurance@spectrumchemical.com if we may be of further assistance.

Sincerely,

Michelle Weston

Michelle Weston
Quality Assurance Specialist

May 3, 2016

Re: Glacial Acetic Acid, USP-AC110

To Whom It May Concern:

Thank you for your interest in Spectrum high quality chemicals.

We at Spectrum Chemical Mfr. Corp. understand the concern regarding Bovine Spongiform Encephalopathy (BSE). Please be assured that the chemical

Glacial Acetic Acid, USP-AC110

is BSE/TSE free.

If you have any further questions, please contact Tech Services at (310) 516-8000 Extension 5471, or by email at techservices@spectrumchemical.com.

Sincerely,

Darlene Dagdag-Lyudmirskiy
Technical Services
Spectrum Chemical Mfr. Corp.

This document has been produced electronically and is valid without a signature

May 11, 2016

Re: Glacial Acetic Acid, USP- AC110

To Whom It May Concern:

Thank you for your interest in Spectrum high quality chemicals.

We at Spectrum Chemical Mfr. Corp. understand the concern regarding the presence of allergens in raw materials. Please be assured that the following chemical does not contain (Milk; Egg; Fish; Shellfish; Sulfur dioxide and sulfites at concentrations of more than 10 mg/kg or 10 mg/liter expressed as SO_2; Tree nuts; Wheat; Peanuts; Soy; Cereals containing Gluten).

Glacial Acetic Acid, USP- AC110

If you have any further questions, please contact Tech Services at (310) 516-8000 Extension 5471, or by email at techservices@spectrumchemical.com.

Sincerely,

Darlene Dagdag-Lyudmirskiy
Technical Services
Spectrum Chemical Mfr. Corp.

This document has been produced electronically and is valid without a signature

April 22, 2016

Re: Glacial Acetic Acid, USP-AC110

To Whom It May Concern:

Thank you for your interest in Spectrum high quality chemicals.

We at Spectrum Chemical Mfg. Corp. understand the concern regarding Aflatoxins in raw materials. To the best of our knowledge, the product listed below is not contaminated with Aflatoxins. Aflatoxins are not used in production. The following product does not come in contact with Aflatoxins at any stage of production.

Glacial Acetic Acid, USP-AC110

If you have any further questions, please contact Tech Services at (310) 516-8000 Extension 5471, or by email at techservices@spectrumchemical.com.

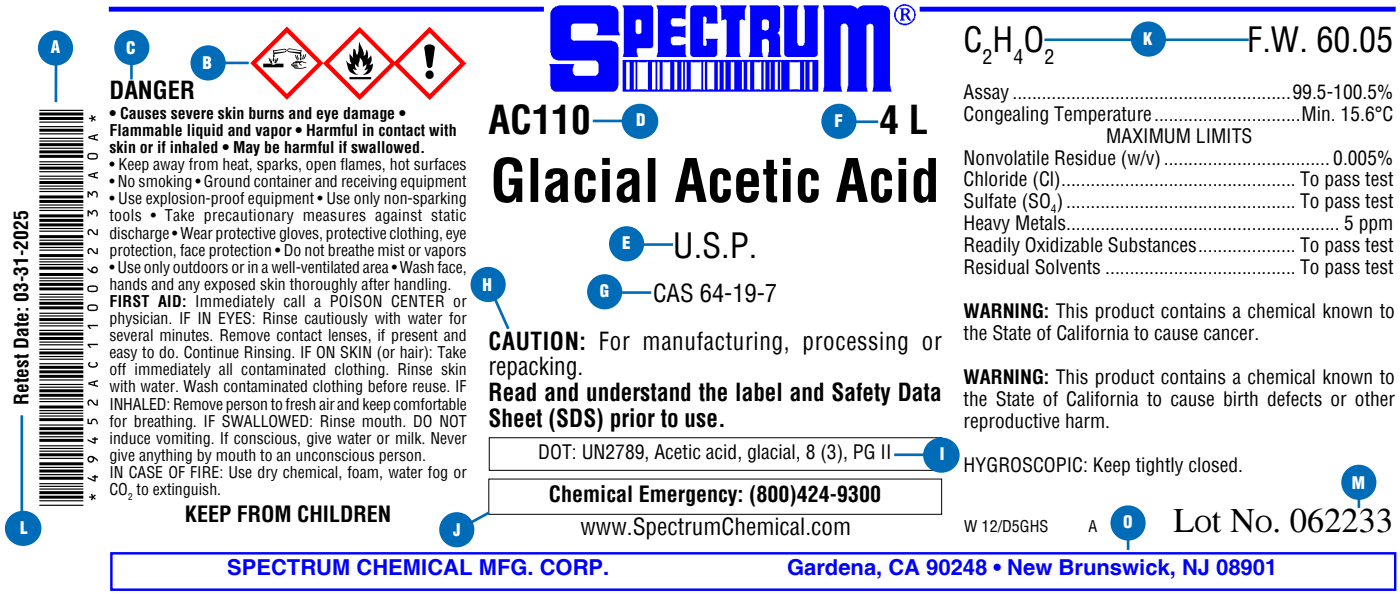
Sincerely,

Darlene Dagdag-Lyudmirskiy
Technical Services
Spectrum Chemical Mfr. Corp.

This document has been produced electronically and is valid without a signature

Label Information

The Spectrum label presents technical and safety information in an easily understood format. Our technical specialists stay abreast of the latest requirements of the Globally Harmonized System for Classification and Labelling of Chemicals (GHS), as well as the Occupational Safety and Health Administration (OSHA), the Food and Drug Administration (FDA) and other government regulatory agencies in order to ensure compliance, accuracy and concise hazard communication.



- **A** Bar Code
- **B** GHS Hazard Pictograms
- **C** Warning, Safety Data and Precautionary Information
- **D** Product Catalog Number
- **E** Item Name, Form, Grade
- **O** Storage Color Band
- **F** Size/Quantity
- **G** Chemical Abstracts Service (CAS) Registry Number
- **H** Caution Information
- **I** DOT Shipping Information
- **J** Toll-Free 24-Hour Chemical Emergency Telephone Number
- **K** Empirical Formula, Formula Weight and Technical Specifications Panel
- **L** Expiration Information
- **M** Lot Number
- **N** Kosher Certified by Kosher Supervision of America (KSA).

This color-coded band indicates the hazard most likely to be posed by that material under storage conditions. The criteria used to assign band colors have been established by the Storage Code working group of the Society for Chemical Hazard Communication (SCHC). It is recommended that like colors be stored together, unless otherwise stated, based on the color codes indicated to the right. However, it is the responsibility of the customer to check with their local fire department for possible conflicts with our recommendations when storing hazardous chemicals.

- **YELLOW**: Oxidizer
- **RED**: Flammable
- **GREEN**: General Storage
- **BLUE**: Health Hazard
- **WHITE**: Corrosive

Spectrum Chemical Mfg Corp

Corporate Headquarters:
769 Jersey Ave.
New Brunswick, NJ 08901
732.214.1300

West Coast Facility:
14422 S. San Pedro St.
Gardena, CA 90248
310.516.8000

Certificate Of Analysis

Item Number	AC110	Lot Number	1EJ0534
Item	Glacial Acetic Acid, USP		
CAS Number	64-19-7		
Molecular Formula	$C_2H_4O_2$	Molecular Weight	60.05

Test	Specification		Result
	min	max	
ASSAY	99.5 - 100.5 %		100.2 %
CONGEALING TEMPERATURE	15.6 C°		15.8°C
NONVOLATILE RESIDUE (w/v)		0.005%	<0.005 %
CHLORIDE (Cl)		TO PASS TEST	PASSES TEST
SULFATES (SO_4)		TO PASS TEST	PASSES TEST
HEAVY METALS		5 ppm	<5 ppm
READILY OXIDIZABLE SUBSTANCES		TO PASS TEST	PASSES TEST
IDENTIFICATION		TO PASS TEST	PASSES TEST
RETEST DATE			30-SEP-2017
RESIDUAL SOLVENTS		TO PASS TEST	.
CLASS 2 (SOLVENT) / METHANOL			<3000 ppm
CLASS 3 (solvent) / FORMIC ACID			<5000 ppm
APPEARANCE			CLEAR COLORLESS LIQUID
MANUFACTURE DATE			11-SEP-2015

Spectrum Chemical Mfg Corp
14422 South San Pedro Street
Gardena 90248 CA

Certificate of Analysis Results Certified By:

Adan Hernandez
Quality Control Manager
Spectrum Chemicals & Laboratory Products

All pharmaceutical ingredients are tested using current edition of applicable pharmacopeia.

January 26, 2016

RE: Lot Numbering System

Dear Valued Customer:

This letter is to inform you of Spectrum Chemicals and Laboratory Products' Lot Numbering System. The system is based on an alpha-numerical sequence which provides the month, year and location of production.

The lot numbering system utilized until 2010 is a sequence of **six characters**, two letters followed by four numbers. The first letter represents the year, for example, Y denotes 2009 and Z denotes 2010. The second letter represents the month and site, for example, A-L denotes January through December at Spectrum's Gardena, CA facility, while M-X denotes January through December at the New Brunswick, NJ facility. The following four numbers are sequentially assigned.

Example: ZI0928 = The 928th material produced in California in September 2010

The lot numbering system utilized for 2011 and forward, is a sequence of **seven characters**. The first character, a number, represents the production facility:

1 = Gardena, CA Facility
2 = New Brunswick, NJ Facility
3 = China Facility

The second character, a letter, represents the year. For example, A denotes 2011 and B denotes 2012. The third character, a letter, represents the month, with A denoting January and L denoting December. The following four numbers are sequentially assigned.

Example: 2AA0706 = The 706th material produced in New Jersey in January 2011

Thank you for your interest with Spectrum products. Please feel free to contact us at 310-516-8000 or via email at qualityassurance@spectrumchemical.com if we may be of further assistance.

Sincerely,

Michael Dang
Manager, GMP Compliance

Stability – Shelf Life Guidance

Product Covered: AC110, Glacial Acetic Acid, USP

Spectrum Chemical's manufacturing partner has assigned the following shelf life guidance for the product listed above.

The product, AC110, Glacial Acetic Acid, USP, is assigned a 24 months shelf life from date of manufacturing. The quality and integrity of the chemical depends on the handling and storage conditions. Please refer to the Safety Data Sheet for proper storage and handling procedures.

Adan R. Hernandez
Quality Control Manager

Corporate Headquarters
769 Jersey Avenue
New Brunswick, NJ 08901-3605

12.May.2016