



Department of Chemical Engineering Experiment Safety Plan

An Experimental Safety Plan (ESP) is required for every experiment conducted within the Department, or by Department Employees/Students at a location away from the Department (Jett Hall). The purpose of the ESP is to assure the safety of all by identifying the safest possible methods to conduct an experiment. By signing below the individual(s) conducting the experiment, Chemical Hygiene Officer (CHO), and the faculty advisor acknowledge responsibility for the following requirements.

- 1) Appropriate Personal Protective Equipment (PPE) **must always** be worn while in the lab (as described in the ESP). The minimum required PPE to enter a research/teaching lab in Jett Hall is (1) long pants, (2) closed toe shoes, (3) lab coat or long sleeve shirt, and (4) safety glasses with side shields.
- 2) For safety reasons, no researcher is permitted to work alone in the lab at any time. Because the labs are open 24/7, there may be occasions (such as a late night or over weekends) when there are no other people working in the lab. If you plan to work during a time when the lab might be expected to be empty, please plan ahead and coordinate your work schedule with another lab member.
- 3) Training **must be completed** prior to working the experiment in the lab. The minimum required training to enter the lab can be completed through EH&S and includes the following courses: (1) Employee & HAZCOM Safety, (2) Lab Standard, and (3) Hazardous Waste Management [see Attachment 5]. Researchers must also attend an EHS annual lab refresher seminar. Other training may be required based on the review of the ESP by the CHO and/or EH&S personnel.
- 4) ESP approval occurs in two phases. Phase I is the preparation of a written safety plan. Upon approval of the written plan, researcher(s) may order equipment and necessary supplies, and begin to assemble the experiment. Phase I also includes an evaluation by CHO (and if appropriate by EH&S) to establish controls of hazardous operations, avoid the purchase of inappropriate supplies, and establish expected waste(s) streams. Phase II approval requires evaluation of the assembled experiment, and a "dry run" of the experimental procedure or Emergency Shutdown Procedure. High Hazard work may be subject to approval by official university boards, including any work with radioactive materials or radiation producing machines, certain biological materials, animals and/or human subjects.

	CHO signature	Date
ESP Phase I approval		
ESP Phase II approval		

- 5) By signing below, both faculty advisor and researchers(s) understand that the CHO can approve/disapprove any part of the ESP. The CHO can further assemble a committee of individuals with appropriate technical or EH&S background to assist in reviewing the ESP. It is the goal of the CHO to help the researcher(s) find the safest method(s) of conducting an experiment. The CHO, or any faculty member, can stop lab activity if the individuals are not performing good lab practices.

	Name	Signature	Date
Faculty Advisor			
Researcher			
Researcher			
EH&S for High Hazards (Attachment 6) or if requested by CHO			

NMSU Chemical Engineering Experiment Safety Plan (ESP)

This document must be typed.

Name/Title of Experiment:	Kettle Corn manufacture	
Building and Room Number:	JH 171 and on-site operations within a tent	
Location of Experiment within Room:	See sketch in Attachment 2	
Emergency Contacts:	EMERGENCY	911
Department Engineer	Meng Zhou	(575) 646-1214
Faculty Advisor	David Rockstraw	(575) 635-9539
Department Head	David Rockstraw	(575) 635-9539
Responsible Researcher	Diego Gomez	

Required attachments to the ESP:

Attachment 1: Experiment Scope

Attachment 2: Drawing of the laboratory or pilot area

Attachment 3: Normal Operations, Startup and Shutdown Procedures

Attachment 4: Emergency Shutdown Procedure and medical emergency instructions.

Attachment 5: Waste Management Procedure

Attachment 6: Hazard Identification and Mitigation

Attachment 7: Material Safety Data Sheets

Attachment 1 – Experiment Scope

Provide a concise description of the laboratory experiment to be undertaken. Explain why the work is being performed, the goal(s) of the experimental program, the stoichiometry of any chemical reactions and their heats of reaction, and a list of all chemicals to be used in the work.

This work is being performed as a *fund-raising activity for the NMSU AIChE Student Chapter.*

Goals of this procedure are to:

- safely produce a saleable food product; and
- efficiently use the ingredients to maximize popcorn yield.

Chemicals to be used per batch:

- 6 cups of hybridized corn kernels (puffs into a perfect “mushroom ball” of fluffed corn, rather than a fragile “butterfly” shape. See inset photograph)
- 24 oz. of corn oil
- 2 cups sugar
- any additional desired flavorings (e.g., chile powder, cayenne pepper, cinnamon, etc.)



Chemistry and physical phenomena

Corn kernels will be mixed with corn oil and sugar (flavoring additive) over a propane flame (at 10-11 psig backpressure). The hull of the corn kernels is impermeable to water, and therefore the moisture within the kernel will reach a superheated state. Under such conditions in the kernel, the starches gelatinize, forming a white pliable solid.

Starches are polysaccharides, or strings of sugar molecules, consisting of two types of molecules: amylose (linear) and amylopectin (branched). In a typical corn starch, amylose comprises about 25 wt%, while amylopectin represents 75 wt%. In a starch granule, amylose and amylopectin strands arrange themselves in a starburst pattern around a central point called a hilum. Hydrogen bonds between the strands give the granule its strength and shape.

Gelatinization is a physical process by which water penetrates a starch granule, causing the granule to swell, leading to a weakening of hydrogen bonding and permitting the linear amylose strands to be released from the granule, while the amylopectin remains inside the granule. The granule ultimately collapses, losing its shape, while the freed amylose thickens and stabilizes on the outside surface of the granule.

This white solid remains compressed within the kernel hull until a temperature of around 350°F is reached, at which point the kernel internal pressure reaches about 135 psi and the kernel hull fails, causing the kernel to “pop” and the solid starchy material is released. The rapid expansion of the starch and proteins creates a solid that resembles a white foam.

Chemical Process Engineering

The kernel is raised to popping temperature in a corn oil heat transfer medium contained in a stainless steel kettle that is heated over an open propane flame.

There is no heat of reaction associated with corn popping. While some of the proteins in the corn kernel are denatured in the process, the popping of the corn kernel is primarily a physical, not a chemical change.

Attachment 2 - Drawing of the laboratory or pilot area

Provide a detailed drawing of the laboratory or pilot area in which the work will be performed. Include locations of the experimental equipment, safety equipment (including eyewash stations and safety showers, fire extinguishers, first aid kits, and telephones, also noting the dates of last inspection where relevant), MSDS compilation, chemical storage, and evacuation route.

The kettle corn tent will be referred to as “the operation” in the operating procedures.

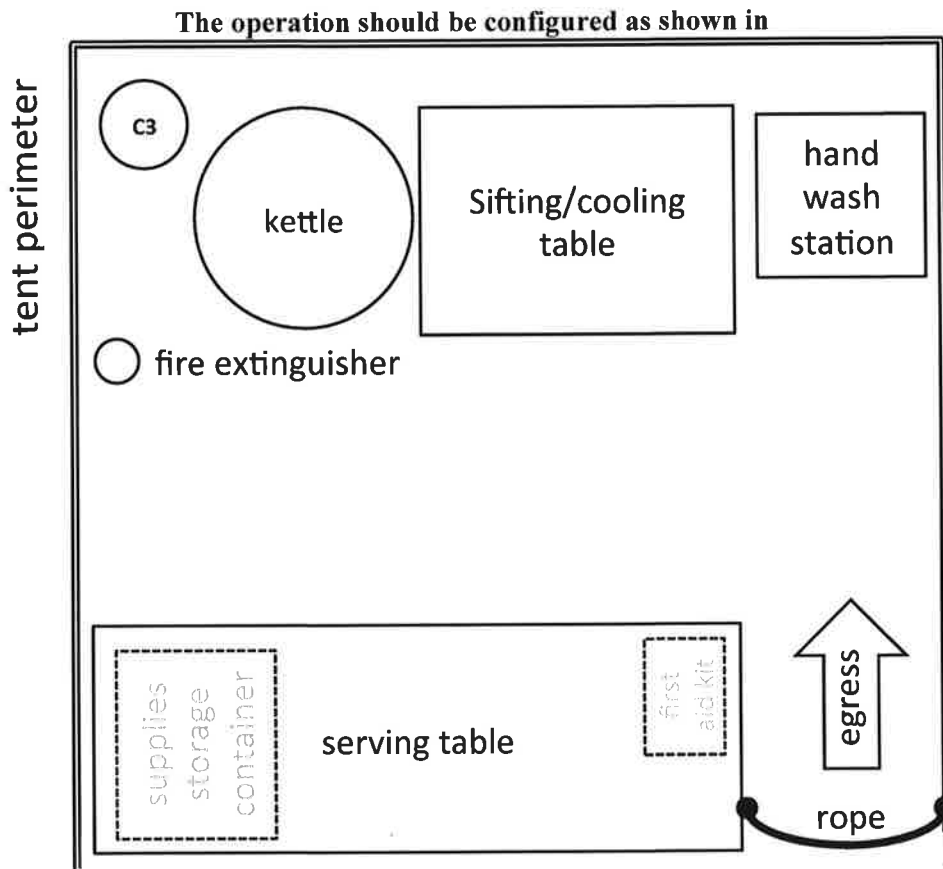


Figure 1.

The propane cylinder (C3), kettle, and sifting/cooling table are located in the back of the tent, away from the opening of the tent. Locate the kettle at least 1 foot from tent wall to assure the tent will not catch fire.

The fire extinguisher should be located where it is readily accessible in the event of a fire.

A serving table and a rope are used to prevent access to the inside of the operation. The serving table should be draped with a covering (preferably printed with AICHE chapter information) that extends down the front side of the table and is secured under the feet of the table, thereby creating a semi-secure area to place/store items such as popcorn supplies, a secondary propane cylinder and backpacks of the operators.

MSDS binder should be stored with the supplies.

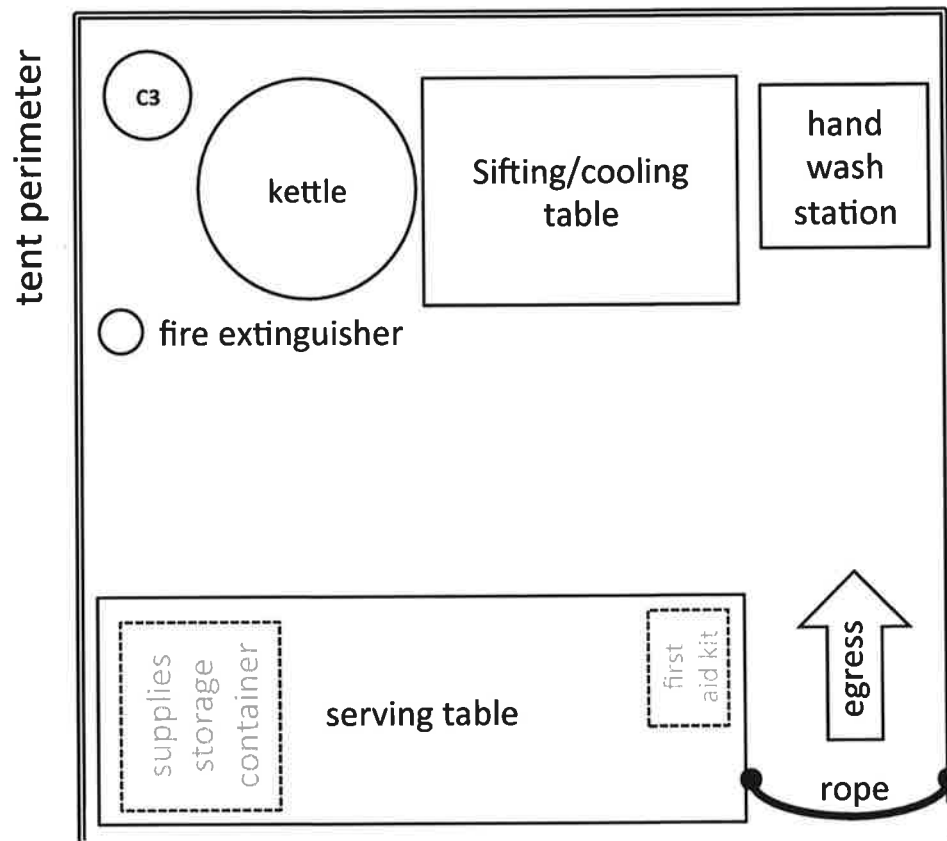


Figure 1. Configuration of kettlecorn tent operations.

First aid kit

In addition to the normal contents, the first aid kit for this operation should include a sterile cloth compress, a bottle of clean water, and a zinc-oxide cream for the treatment of mild burns.

Attachment 3 – Normal Operations, Startup and Shutdown Procedures

Provide a step-wise procedure that describes in detail how the work will be performed. The procedure should begin and end assuming the equipment is in the normal idle (inoperative) state.

Normal Operation

1. The kettle should have been cleaned after the last use. Assuming this to be the case, wipe out the kettle with a damp clean paper towel. If the kettle is found to be in need of cleaning, refer to the kettle cleaning procedure.
2. Locate the operation in an area where access to the equipment can be controlled and limited. Note in the logbook the date and location of the operation for the day.
3. First time operators must watch the instructional video PILOT/PROPANE.
http://www.youtube.com/watch?v=zqg--0PvaI8&feature=player_embedded
4. Check fire extinguisher inspection date.

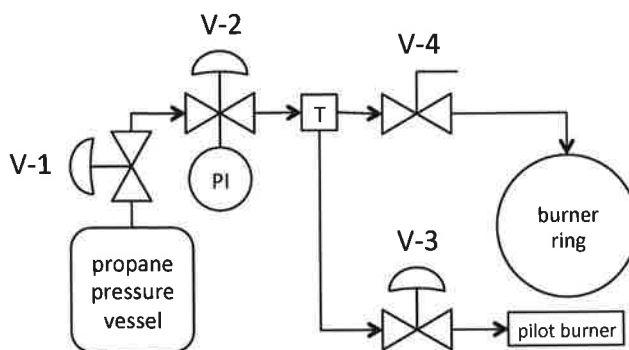


Figure 2. Schematic of propane feed system

5. Close valves V-1 (on the propane cylinder), V-3, and V-4. Connect the regulator (V-2) to the propane tank, using a wrench for a no leak connection and secure fit. Keep the wrench next to the propane cylinder in the even the cylinder needs to be moved quickly due to a fire.
6. Inspect the propane hose and connections to assure they are clean and in proper working order before igniting the pilot.
7. Operating the popcorn machine in the steps that follow requires the following PPE: (1) a face shield and fire/heat-resistant (2) gloves and (3) apron. Any personnel authorized to be in the tent with the operator must wear safety glasses, long pants, long sleeve shirt, and close-toed shoes. No more than 3 operators should be present in the tent at a time.
8. Note in the logbook the batch number as YYYYMMDD##, where YYYY is the year, MM is the month, DD is the date, and ## is the two digit batch number for that day. Note any flavorings and amounts that are used in the batch.
9. Add 24 to 30 oz. of corn oil to kettle.
10. Open V-1 all the way.
11. The desired gas pressure in the system is between 10 and 12 psig. To achieve this set pressure, adjust V-2, then open and close V-3 to bleed any excess pressure. If desired pressure range is not met, repeat this step until a set pressure of 10-12 psig is established.

If propane tank pressure drops below 10 psig, have the tank refilled (do not use a cylinder exchange program).

12. To light the pilot burner, crack open valve V-3 slightly until you can hear the propane hissing. Light the pilot burner with a stick lighter. If the pilot does not light, turn the gas off wait 30-45 seconds for gas to clear and try again. Using V-3, adjust the gas flow until the pilot flame just remains stationary. This can best be seen in the video noted in Step 2.
13. When pilot is lit, open valve V-4 (ball valve will turn 90°). Gas flow and flame will be loud, therefore the operator may wish to insert ear protection prior to initiating the flame.
14. Add 3 popcorn kernels to the kettle to act as thermometers to identify when the kettle has reached popping temperature.
15. When the 3 kernels have popped, add 6 cups of kernels (all at once) and begin to stir. Add kernels against the side of the kettle such that they slide down the wall into the oil, thereby preventing splashing of the hot oil. Watch for the popcorn to turn lighter in color right before it starts popping, immediately add 2 cups of sugar.
16. **Stir continuously** to achieve a uniform temperature across the mixture contained in the kettle. When the contents of the kernel reach a temperature at which the hull can no longer mechanically withstand the pressure of the superheated steam contained within the kernel, the hull fails. If a uniform temperature was maintained through efficient mixing, the kernels all pop in a short period of time. The noise will be loud and rapid like machine gun fire, and the kettle fills very fast. **Continue to stir.** Perform this operation with your face shield at an angle near normal to the kettle opening to minimize the potential for flying kernels to breach the shield and hit your face.
17. With continued stirring, close valve V-4 (preferably have an assistant close the valve to permit uninterrupted stirring), then dump the kettle into the collection bin.
18. After dumping the kettle, shake the bin to remove any excess kernels, salt/seasoning to taste, transfer to bags for serving. Use caution when adding some flavorings. For instance, cayenne pepper has an HIMS health hazard rating of 3, and hazardous if contact occurs with the eyes or skin, through ingestion, or inhalation. *If a flavoring additive is being added that contains oleoresin capsicum, wear latex gloves and a particulate dust mask.*
19. Note in the logbook the number of bags filled by the batch.
20. Before starting a new batch, assure all popcorn and debris have been emptied from kettle. If you do not do this step a fire may start in your kettle. In case of a fire in the kettle, turn off all gas and wait until fire ceases after the oil (fuel) is consumed. Do not use the extinguisher unless the fire extends beyond the confines of the kettle.
21. **NEVER DUMP HOT OIL FROM THE KETTLE!!!** Use the stir paddle to remove burning kernels and popcorn. Sugar can be sprinkled on any remaining flame to extinguish a fire. Keep all popped corn out from underneath the kettle.
22. Upon conclusion of the last batch, close V-1. The pilot light will be extinguished as the end of the gas leaves the supply line. No need to change the setting on V-2, as the current setting will result in a gas pressure close to the desired system gas pressure upon the next startup.
23. Permit the kettle to cool to ambient temperature before removing from the tent. Continue to monitor and restrict access to the tent until the kettle has cooled.

Cleaning the kettle

Kettle cleaning should occur after cooling, at the conclusion of the day's operations. Cleaning procedure should be followed prior to first use of a new kettle.

This procedure should be performed outside the door of JH 171 so that liquid residuals may be dumped down the floor sewer.

Standard minimum lab PPE is required.

1. Spray the internal surface of the kettle with water. Add a USDA-approved cleaner designed for kettlecorn machines (such as Heat 'n Kleen Popcorn Kettle Cleaner by Gold Medal Products Co. of Cincinnati, OH). The cleaner should be mixed to 100 ppm concentration.
2. Use a steel wool scouring pad to buff the entire internal surface of the kettle.
3. Water rinse the internal kettle surface.
4. Pour accumulated liquid into a bucket as necessary, and dump in the floor sewer of JH 171.
5. Dry the internal kettle surface with paper towels.
6. Apply a thin coat of corn oil to the internal kettle surface using a clean paper towel.

Attachment 4 -. Emergency Shutdown Procedure

Provide a step-wise procedure that describes how the equipment will be brought to a safe state in the event of an emergency. The description should also include a detailed explanation of how to attend to potential medical emergencies that may result. Address any hazardous states identified in Attachment 6 in this discussion that may be brought about by such an emergency.

Fire

1. Close V-1.
2. Disconnect and move the propane cylinder away from the flames/heat.
3. Call the fire department.
4. Use the fire extinguisher to control the fire.

Injury

1. Close V-1.
2. If the nature of the injury is serious, call 911.
3. In the event of a first- or second-degree burn, apply a wet compress to the injured area for about 15 minutes, then apply a zinc-oxide burn cream. Report any injuries to the CH E Chemical Hygiene Office or Department Head.

Attachment 5 - Waste Management Procedure

Prepare a Waste Management Procedure that provides the exact nature and volumes of all wastes to be generated in performing these experiments. This plan must be forwarded to the EH&S Environmental Affairs Manager (currently Andrew Kaczmarek, kaczmare@nmsu.edu) for approval. Attach a copy of this approval to the ESP. Waste Tracking Forms should be obtained before beginning any experimental work.

Two non-hazardous wastes will be generated while running of the kettlecorn operation:

1. **Unpopped corn kernels** will be collected on the sifting table and may be discarded in the regular trash AFTER they have cooled to ambient temperature.
2. **Wash water waste** containing citrus cleaner, corn oil char, and water will be generated in the cleaning of the kettle. This solution may be poured into the city sewer, preferably through the floor drain in JH 171. If it becomes necessary to use an oven/grease cleaner to remove stubborn stains/deposits, the solution should be collected and placed in the aqueous waste accumulation vessel in the JH 171 waste collection point. To minimize waste generated, empty the aqueous waste and rinse water prior to pressure spraying of the surface.

Attachment 6 – Hazard Identification and Mitigation

Using the table below, identify ALL of the hazards associated with the experiment and work area. The analysis should include all sources of energy (electric, chemical, hydraulics, mechanical, compressed gases), extreme conditions of pressure or temperature (from flame or steam to cryogenics), chemical storage, housekeeping, fire, and/or biological hazards.

Designate the HIGH HAZARDS and include descriptions of appropriate PPE, researcher training, and engineering controls to be used to mitigate these hazards. HIGH HAZARDS include substances that are highly reactive, radioactive, highly flammable, highly toxic, mutagenic, teratogenic, carcinogenic, or have very low exposure limits and/or conditions with high voltage, high RF, x-ray, laser (class 3b or 4), high pressure or pressurizing vessels. When in doubt about whether a substance represents a HIGH HAZARD, ask the CHO.

http://www.nmsu.edu/~safety/programs/lab_safety/PriorApprovalForms.doc

Please attach the completed checklists to your ESP.

For each Hazard identified, provide the following information:

- Hazard description
- HIGH HAZARD? (Yes or No)
- Operational – a list of industry best-practices this safety hazard
- A list of engineering controls
- A list of the required PPE
- A list of Special training that is necessary

Compressed propane cylinder

Propane is also referred to as liquefied petroleum gas (LPG). It is stored as in the liquid phase under pressure, and used as a fuel in the gas phase.

Severe freeze burn or frostbite can result if propane liquid comes in contact with your skin. Wear thermal resistant gloves when connecting the regulator.

A propane leak can lead to a fire. Propane has a strong pungent odor due to additives to assure a leak can be easily detected. If propane is smelled, turn off V-1 and evacuate the tent until the smell clears. Do not restart operations until the source of the smell is understood.

Do not permit smoking in the vicinity of the propane cylinder

When it is time to refill the cylinder,

- close the cylinder valve and remove the regulator;
- transport and store a cylinder in a secure and upright position so it will not fall, shift, or roll;
- place the cylinder in a well-ventilated area of the vehicle;
- proceed directly to and from your destination, do not run other errands; and
- immediately remove the cylinder from the vehicle.

Hot corn oil

The corn kernels will be brought to popping temperature in hot oil. Propane flow rate to the burner will be set at 10-11 psig, which will provide an oil temperature of 350°F (the temperature at which the popping of the kernels occurs).

PPE required to work with the hot corn oil is defined to completely cover exposed skin, and includes a full face shield, heat-resistant gloves, a neoprene apron, long sleeves and pants, and close-toed shoes.

The kettle containing the hot oil will be located in the back of the tent, away from customers and others.

Projectile corn kernels

Popcorn kernels can become hot projectiles upon popping. The operator of the kettle is required to wear a full face shield to protect his/her face and heat-resistant gloves to protect hands from flying kernels.

The kettle is located in the rear of the tent, surrounded on three side by the tent walls to prevent projectiles from leaving the vicinity of the operation.

Oleoresin Capsicum

Pepper flavors contain *oleoresin capsicum*, which can irritate the eyes, skin, and lung. Caution must be used to assure the operator is not exposed to excessive amounts of this material. Whenever the operator is sprinkling flavorings that contain *oleoresin capsicum* over the popped corn product, latex gloves, safety glasses, and a particle respirator must be worn.

The following items were identified with Y on the NMSU Lab (JHA) Hazard Assessment form:

Splash hazard of hot corn oil – This hazard is addressed through required PPE and procedurally through method of addition of the corn kernels.

Small volumes of flammable corn oil – The formation of any corn oil fire is expected to be small and fully contained in the kettle without risk of spreading. Procedurally, the fire will be allowed to consume the fuel.

Propane cylinder under pressure and contains a cryogenic liquid – The propane cylinder is a compressed gas. Safe handling and location of the cylinder has been addressed from a procedural perspective. PPE required to work with the cylinder will prevent the possibility of contact with any released cryogenic liquid.

Working with high temperatures, hot liquids, open flames – High temperatures and open flames exist in this system. Engineering controls have been implemented through extensive PPE requirements to assure no skin remains exposed during operations. In addition, detailed operating procedures concerning the connecting of the propane cylinder to the system and valve alignment have been developed to maintain safe operation with these high temperature systems.

Working with loud equipment – The propane heating system may be loud. The operator may wish to wear ear plugs to mitigate this industrial noise.

NMSU Lab (JHA) Hazard Assessment (Questions EH&S -<http://safety.nmsu.edu> or 575-646-3327) Sept. 2012

Are the following activities performed in the lab?		Physical Hazards	
Activity	Y/N	Potential Hazard	Applicable PPE
Working with cryogenic liquids.	If yes Y	Major skin, tissue, or eye damage.	Safety glasses or goggles for large volumes, impermeable insulated gloves, lab coat.
Removing freezer vials from liquid nitrogen	If yes N	Vials may explode upon rapid warming. Cuts to face/neck and frostbite to hands	Face shield, impermeable insulated gloves, lab coat.
Working with very cold equipment or dry ice.	If yes N	Frostbite, hypothermia.	Safety glasses, insulated gloves (possibly warm clothing), lab coat.
Working with hot liquids, equipment, open flames (autoclave, Bunsen burner, water bath, oil bath).	If yes Y	Burns resulting in skin or eye damage.	Safety glasses or goggles for large volumes, insulated gloves (impermeable insulated gloves for liquids, steam), lab coat.
Glassware washing.	N	If yes Lacerations.	Heavy rubber gloves, lab coat.
Working with loud equipment, noises, sounds, alarms, etc.	If yes Y	Potential ear damage and hearing loss.	Earplugs or ear muffs as necessary.
Working with a centrifuge.	If yes N	Imbalanced rotor can lead to broken vials, cuts, exposure.	Safety glasses or goggles, lab coat, latex, vinyl, or nitrile gloves.
Working with a sonicator.	If yes N	Ear damage, exposure.	Safety glasses or goggles, lab coat, latex, vinyl, or nitrile gloves, ear plugs.
Working with sharps.	If yes N	Cuts, exposure.	Safety glasses or goggles, lab coat, latex, vinyl, or nitrile

Are the following activities performed in the lab?		Nanomaterial Hazard	
Activity	Y/N	Potential Hazard	Applicable PPE
Working with engineered nanomaterials ⁸ .	If yes N	Inhalation, exposure, dermal exposure.	Goggles, gloves, lab coat.

1 Use a chemical exhaust hood or other engineering control whenever possible. Activities conducted outside a hood or other engineering control (local bench exhaust) may need to be evaluated for a respiratory hazards. A respirator may be required & a respiratory protection program must be in place per EH&S Respiratory Protection Program. In addition to engineering controls and PPE, consider personal clothing that provides adequate skin coverage.

2 Dusty solids should be separately evaluated for the need to use respiratory protection.

3 For a list of acutely toxic chemicals, visit safety.nmsu.edu and navigate to Chemical Safety.

4 Chemical-resistant gloves are to be selected based on chemical(s) in use (see glove guide).

5 Use a Biosafety cabinet to minimize exposure or evaluated by Biosafety Officer.

6 Laser pointers, copiers, and readers are not currently subject to general or specific PPE requirements.

7 Appropriate skin protection can include lab coat, gloves, sun block, barrier cream.

8 Nanomaterial work is to be evaluated for respiratory protection.

September 6, 2012 (after UCLA LHATS developed by <http://www.ehs.ucla.edu/>)

NMSU Lab (JHA) Hazard Assessment (Questions EH&S -<http://safety.nmsu.edu> or 575-646-3327) Sept.2012

Are the following activities performed in the lab?		Chemical Hazards	
Activity	Y/N	Potential Hazard	Applicable PPE
Working with small volumes (<4 liters) of corrosive liquids.	If yes N	Eye or skin damage.	Safety glasses or goggles. Light chemical-resistant gloves. Lab coat.
Working with large volumes (>4 liters) of corrosive liquids, small to large volumes of acutely toxic corrosives, or work which creates a splash hazard. ¹	If yes Y	Poisoning, increased potential for eye and skin damage.	Safety goggles. Heavy chemical-resistant gloves. Lab coat and chemical-resistant apron.
Working with small volumes (<4 liters) of organic solvents or flammable organic compounds.	If yes Y	Skin or eye damage, potential poisoning through skin contact.	Safety glasses or goggles. Light chemical-resistant gloves. Lab coat.
Working with large volumes (>4 liters) of organic solvents, small to large volumes of very dangerous solvents, or work which creates a splash hazard. ¹	If yes N	Major skin or eye damage, potential poisoning through skin contact. Fire.	Safety goggles. Heavy chemical-resistant gloves. Flame-resistant lab coat (e.g. Nomex).
Working with toxic or hazardous chemicals (solid, liquid, or gas). ^{1,2}	If yes N	Skin or eye damage, potential poisoning through skin contact.	Safety glasses (goggles for large quantities). Light chemical-resistant gloves. Lab coat.
Working with acutely toxic or hazardous chemicals (solid, liquid, or gas). ^{1,2,3}	If yes N	Increased potential for eye or skin damage, increased potential poisoning through skin contact.	Safety goggles. Heavy chemical-resistant gloves. Lab coat.
Working with an apparatus with contents under pressure or vacuum.	If yes Y	Eye or skin damage.	Safety glasses or goggles, face shield for high risk activities. Chemical-resistant gloves. Lab coat, chemical-resistant apron for high risk activities.
Working with air or water reactive chemicals.	If yes N	Severe skin and eye damage. Fire.	Work in inert atmosphere, when possible. Safety glasses or goggles. Chemical-resistant gloves. Lab coat, flame resistant lab coat for high risk activities (e.g. Nomex). Chemical-resistant apron for high risk activities.
Working with potentially explosive chemicals.	If yes N	Splash, detonation, flying debris, skin and eye damage. Fire.	Safety glasses, face shield, and blast shield. Heavy gloves. Flame-resistant lab coat (e.g. Nomex).
Working with low and high temperatures.	If yes Y	Burns, splashes. Fire.	Safety glasses. Lab coat. Thermal insulated gloves, when needed.
Minor chemical spill cleanup.	If yes N	Skin or eye damage, respiratory damage.	Safety glasses or goggles. Chemical-resistant gloves. Lab coat. Chemical-resistant apron and boot/shoe covers for high risk activities. Respirator as needed. Consider keeping Silver Shield gloves in the lab spill kit.

NMSU Lab (JHA) Hazard Assessment (Questions EH&S-<http://safety.nmsu.edu> or 575-646-3327) Sept. 2012

Are the following activities performed in the lab?		Biological Hazards	
Activity	Y/N	Potential Hazard	Applicable PPE
Working with human blood, body fluids, tissues, or blood borne pathogens (BBP). ⁵	If yes N	Exposure to infectious material.	Safety goggles with face shield or facemask plus goggles, latex or nitrile gloves, lab coat or gown.
Working with preserved animal and/or human specimens.	If yes N	Exposure to infectious material or preservatives.	Safety glasses or goggles, protective gloves such as light latex or nitrile for unpreserved specimens (select protective glove for preserved specimens according to preservative used), lab coat or gown.
Working with radioactive human blood, body fluids, or blood borne pathogens (BBP).	If yes N	Cell damage, potential spread of radioactive contaminants, or potential BBP exposure.	Safety glasses (goggles for splash hazard), light latex or nitrile gloves, lab coat or gown.
Working with agents or recombinant DNA classified as Biosafety Level 1 (BSL-1).	If yes N	Eye or skin irritation.	Safety glasses or goggles for protection from splash or other eye hazard, light latex or nitrile gloves for broken skin or skin rash, lab coat or gown.
Manipulation of cell lines, viruses, bacteria, or other organisms classified as Biosafety Level 2 (BSL-2). ⁵	If yes N	Exposure to infectious material, particularly through broken skin or mucous membranes.	Safety glasses or goggles for protection from splash or other eye hazard, light latex or nitrile gloves, lab coat or gown.
Manipulation of infectious materials classified as Biosafety Level 2 facility with BSL-3 practices (BSL-2+).	If yes N	Exposure to infectious materials with high risk of exposure by contact or mucous membranes.	Safety glasses or goggles for protection from splash or other eye hazard, light latex or nitrile gloves (double), lab coat or disposable gown (preferred), surgical mask.
Manipulation of infectious materials classified as Biosafety Level 3 (BSL-3).	If yes N	Exposure to infectious materials with high risk of exposure, particularly through the inhalation route.	Safety glasses or goggles for protection from splash or other eye hazard, light latex or nitrile gloves (double), full disposable gown or Tyvek suite (preferred), respirator, shoe cover or dedicated shoe.
Working with live animals (Animal Biosafety Level 1, ABL-1).	If yes N	Animal bites, allergies.	Safety glasses or goggles for protection from splash or other eye hazard, light latex, nitrile or vinyl gloves for broken skin or skin rash, lab coat or gown. Consider need for wire mesh glove.
Working with live animals (Animal Biosafety Level 2). ⁵	If yes N	Animal bites, exposure to infectious material, allergies.	Safety glasses or goggles for protection from splash or other eye hazard, light latex, nitrile or vinyl gloves, lab gown, hair cover, shoe covers, surgical mask. Consider need for wire mesh glove.

NMSU Lab (JHA) Hazard Assessment (Questions EH&S -<http://safety.nmsu.edu> or 575-646-3327) Sept.2012

Are the following activities performed in the lab?		Radiological Hazards	
Activity	Y/N	Potential Hazard	Applicable PPE
Working with solid radioactive materials or waste.	If yes N	Cell damage, potential spread of radioactive materials.	Safety glasses, impermeable gloves, lab coat.
Working with radioactive materials in hazardous chemicals (corrosives, flammables, liquids, powders, etc.).	If yes N	Cell damage or spread of contamination plus hazards for the specific chemical.	Safety glasses (or goggles for splash hazard), light chemical-resistant gloves, lab coat. Note: Select glove for the applicable chemical hazards above.
Working with ultraviolet radiation.	If yes N	Conjunctivitis, corneal damage, skin redness.	UV face shield and goggles, lab coat.
Working with infrared emitting equipment (e.g. glass blowing).	If yes N	Cataracts, burns to cornea.	Appropriate shaded goggles, lab coat.

NMSU Lab (JHA) Hazard Assessment (Questions EH&S -<http://safety.nmsu.edu> or 575-646-3327) Sept.2012

Are the following activities performed in the lab?		Laser Hazards	
Activity	Y/N	Potential Hazard	Applicable PPE
Open Beam			
Performing alignment, troubleshooting or maintenance that requires working with an open beam and/or defeating the interlock(s) on any Class 3 or Class 4	If yes N	Eye damage.	Appropriately shaded goggles/glasses with optical density based on individual beam parameters.
Viewing a Class 3R laser beam with magnifying optics (including eyeglasses).	If yes N	Eye damage.	Appropriately shaded goggles/glasses with optical density based on individual beam parameters.
Working with a Class 3B laser open beam system with the potential for producing direct or specular reflections.	If yes N	Eye damage, skin damage.	Appropriately shaded goggles/glasses with optical density based on individual beam parameters, appropriate skin protection. ⁷
Working with a Class 4 laser open beam system with the potential for producing direct, specular, or diffuse reflections.	If yes N	Eye damage, skin damage.	Appropriately shaded goggles/glasses with optical density based on individual beam parameters, appropriate skin protection. ⁷
Non-Beam			
Handling dye laser materials, such as powdered dyes, chemicals, and solvents.	If yes N	Cancer, explosion, fire.	Gloves, safety glasses, flame-resistant lab coat or coveralls.
Maintaining and repairing power sources for large Class 3B and Class 4 laser systems.	If yes N	Electrocution, explosion, fire.	Electrical isolation mat, flame-resistant lab coat or coveralls.

Attachment 7 – Material Safety Data Sheets for all chemicals used/generated in experiment

Material Safety Data Sheet



Cinnamon Flavor, Natural and Artificial

Revised: 12/19/2012
Replaces: 11/12/2012
Printed: 03/08/2013

Carolina Biological Supply Company

2700 York Rd | Burlington, NC 27215 • to order: 800.334.5551 • for support: 800.227.1150

CAROLINA
www.carolina.com

Section 1 - Product Description

Product Name: Cinnamon Flavor, Natural and Artificial

Product Code(s): 11-3411

Size: various

Chemical Name: See Section 3

CAS Number: N/A

Formula: See Section 3

Synonyms: Cinnamon Flavoring, Cinnamon Oil, Cinnamaldehyde, (2E)-3-phenylprop-2-enal, Cinnamic aldehyde

Distributor: Carolina Biological Supply Company, 2700 York Road, Burlington, NC 27215

Chemical Information: 800-227-1150 (8am-5pm (ET) M-F) **Chemtrec** 800-424-9300 (Transportation Spill Response 24 hours)

Section 2 - Hazard Identification

Emergency Overview: Irritating to eyes and respiratory system.

Potential Health Effects:

Eyes: May cause irritation.

Ingestion: May cause gastrointestinal discomfort.

Skin: May cause irritation to skin.

Inhalation: May cause irritation to respiratory tract.

Section 3 - Composition / Information on Ingredients

Principal Hazardous Components: The composition of this product is a trade secret and the formula is withheld as per 29 CFR 1910.1200. Contains no product determined by NTP, IARC or OSHA to be carcinogens

TLV units: N/A

PEL units: N/A

Section 4 - First Aid Measures

Emergency and First Aid Procedures:

Eyes - In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

Skin - After contact with skin, take off immediately all contaminated clothing, and wash immediately with plenty of water.

Ingestion - If swallowed, do not induce vomiting; seek medical advice immediately and show this container or label.

Inhalation - In case of accident by inhalation: remove casualty to fresh air and keep at rest.

Section 5 - Firefighting Procedures

Flash Point (Method Used): 115°C (239°F)

NFPA Rating:

Health: 1

Fire: 2

Reactivity: 0

Extinguisher Media: Use dry chemical, CO2 or appropriate foam.

Flammable Limits in Air % by Volume: N/A

Autoignition Temperature: N/A

Special Firefighting Procedures: Firefighters should wear full protective equipment and NIOSH approved self-contained breathing apparatus.

Unusual Fire and Explosion Hazards: Closed container may build up pressure if exposed to fire or heat.

Section 6 - Spill or Leak Procedures

Steps to Take in Case Material Is Released or Spilled: Ventilate area of spill. Eliminate all sources of ignition. Remove all non-essential personnel from area. Clean-up personnel should wear proper protective equipment and clothing. Absorb material with suitable absorbent and containerize for disposal.

Section 7 - Special Precautions

Precautions to Take in Handling or Storing: Do not ingest or take internally. Suitable for any general chemical storage.

Section 8 - Protection Information

Respiratory Protection (Specify Type): None needed under normal conditions of use with adequate ventilation. A NIOSH/MSHA chemical cartridge respirator should be worn if PEL or TLV is exceeded.

Ventilation:

Local Exhaust: Acceptable

Mechanical(General): Yes

Special: No

Other: No

Protective Gloves: Natural rubber, Neoprene, PVC or equivalent.

Eye Protection: Splash proof chemical safety goggles should be worn.

Other Protective Clothing or Equipment: Lab coat, apron, eye wash, safety shower.

Section 9 - Physical Data

Molecular Weight: See Section 3

Boiling Point: N/A

Vapor Density(Air=1): Heavier than air

Percent Volatile by Volume: N/A

Solubility in Water: Slightly Soluble

Melting Point: N/A

Vapor Pressure: N/A

Specific Gravity (H2O=1): 1.048

Evaporation Rate (BuAc=1): N/A

Appearance and Odor: Clear, Yellow liquid with pungent odor.

Section 10 - Reactivity Data

Stability: Stable

Conditions to Avoid: Heat and sources of ignition.

Incompatibility (Materials to Avoid): Oxidizers, Reducing agents, Bases,

Hazardous Decomposition Products: COx, Aldehydes,

Hazardous Polymerization: Will not occur

Section 11 - Toxicity Data

Toxicity Data: N/A

Effects of Overexposure:

Acute: See Section 2

Chronic: Not listed as a carcinogen by IARC, NTP or OSHA.

Conditions Aggravated by Overexposure: Respiratory disorders

Target Organs: Gastrointestinal tract

Primary Route(s) of Entry: Inhalation and skin contact.

Section 12 - Ecological Data

EPA Waste Numbers: N/A

Section 13 - Disposal Information

Waste Disposal Methods: Dispose in accordance with all applicable Federal, State and Local regulations. Always contact a permitted waste disposer (TSD) to assure compliance.

Section 14 - Transport Information

DOT Proper Shipping Name: Not Regulated

Section 15 - Regulatory Information

EPA TSCA Status: Not on TSCA Inventory

Hazard Category for SARA Section 311/312 Reporting: Acute

Name List:

No

Chemical Category:

No

CERCLA Section 103 RQ(lb.): No

RCRA Section 261.33: No

Section 16 - Additional Information

The information provided in this Material Safety Data Sheet represents a compilation of data drawn directly from various sources available to us. Carolina Biological Supply makes no representation or guarantee as to the suitability of this information to a particular application of the substance covered in the Material Safety Data Sheet. Any employer must carefully assess the applicability of any information contained herein in regards to the particular use to which the employer puts the material.

Glossary

ACGIH	American Conference of Governmental Industrial Hygienists
CAS Number	Chemical Services Abstract Number
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOT	U.S. Department of Transportation
IARC	International Agency of Research on Cancer
N/A	Not Available
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
ppm	Parts per million
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act
TLV	Threshold Limit Value
TSCA	Toxic Substances Control Act



Health	1
Fire	1
Reactivity	0
Personal Protection	D

Material Safety Data Sheet

Corn oil MSDS

Section 1: Chemical Product and Company Identification

Product Name: Corn oil

Catalog Codes: SLC2668

CAS#: 8001-30-7

RTECS: GM4800000

TSCA: TSCA 8(b) inventory: Corn oil

CI#: Not available.

Synonym: Corn Oil, N.F.

Chemical Name: Corn Oil

Chemical Formula: Not available.

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Corn oil	8001-30-7	100

Toxicological Data on Ingredients: Not applicable.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 392°C (737.6°F)

Flash Points: CLOSED CUP: 254°C (489.2°F).

Flammable Limits: Not available.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Slightly flammable to flammable in presence of heat.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:

Absorb with an inert material and put the spilled material in an appropriate waste disposal. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:

Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe gas/fumes/ vapor/spray. Keep away from incompatibles such as oxidizing agents.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection: Face shield. Synthetic apron. Gloves (impervious).

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

ACHIH - TLV: 10 mg/m³ OSHA - PEL: 15 mg/m³

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Characteristic. (Slight.)

Taste: Not available.

Molecular Weight: Not available.

Color: Yellow. (Light.)

pH (1% soln/water): Not applicable.

Boiling Point: Not available.

Melting Point: -14°C (6.8°F)

Critical Temperature: Not available.

Specific Gravity: 0.918 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact.

Toxicity to Animals:

LD50: Oral [Rat] >100 ml/kg LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

No information on adverse reproductive effects on humans found. Corn oil is used a vehicle in many toxicology studies, and is thereby assumed not to exert important effects in its own right. In fact, the majority of reproductive and developmental toxicology studies using corn oil controls do not note adverse effects; however, there have been only a few studies that directly assess this issue, as follows: Adverse reproductive effects (biochemical and metabolic effects and developmental abnormalities on new born) were found when pregnant rats were fed extremely high amounts of corn oil (36,000 mg/kg and 12,500 mg/kg)

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: May cause skin irritation. Low hazard for usual industrial handling. Eyes: May cause transient irritation. Inhalation: Low hazard for usual industrial handling Ingestion: Ingestion of large amounts may cause gastrointestinal (digestive) tract irritation. Expected to be a low ingestion hazard. Chronic Potential Health Effects: Repeated or prolonged contact may cause allergic reactions in sensitive individuals.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: Not available.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:

Rhode Island RTK hazardous substances: Corn oil Pennsylvania RTK: Corn oil TSCA 8(b) inventory: Corn oil

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):

This product is not classified according to the EU regulations. S24/25- Avoid contact with skin and eyes.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 1

Reactivity: 0

Personal Protection: D

National Fire Protection Association (U.S.A.):

Health: 0

Flammability: 1

Reactivity: 1

Specific hazard:

Protective Equipment:

Gloves (impervious). Synthetic apron. Not applicable. Face shield.

Section 16: Other Information

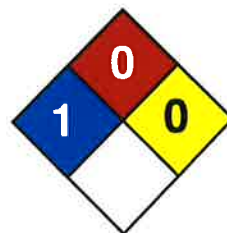
References: Not available.

Other Special Considerations: Not available.

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Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet

Sodium chloride MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium chloride

Catalog Codes: SLS3262, SLS1045, SLS3889, SLS1669, SLS3091

CAS#: 7647-14-5

RTECS: VZ4725000

TSCA: TSCA 8(b) inventory: Sodium chloride

CI#: Not applicable.

Synonym: Salt; Sea Salt

Chemical Name: Sodium chloride

Chemical Formula: NaCl

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium chloride	7647-14-5	100

Toxicological Data on Ingredients: Sodium chloride: ORAL (LD50): Acute: 3000 mg/kg [Rat.]. 4000 mg/kg [Mouse]. DERMAL (LD50): Acute: >10000 mg/kg [Rabbit]. DUST (LC50): Acute: >42000 mg/m 1 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

Skin Contact:

Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops. Cold water may be used.

Serious Skin Contact: Not available.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation: Not available.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: When heated to decomposition it emits toxic fumes.

Special Remarks on Explosion Hazards:

Electrolysis of sodium chloride in presence of nitrogenous compounds to produce chlorine may lead to formation of explosive nitrogen trichloride. Potentially explosive reaction with dichloromaleic anhydride + urea.

Section 6: Accidental Release Measures

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:

Keep locked up.. Do not ingest. Do not breathe dust. Avoid contact with eyes. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Hygroscopic

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Solid crystalline powder.)

Odor: Slight.

Taste: Saline.

Molecular Weight: 58.44 g/mole

Color: White.

pH (1% soln/water): 7 [Neutral.]

Boiling Point: 1413°C (2575.4°F)

Melting Point: 801°C (1473.8°F)

Critical Temperature: Not available.

Specific Gravity: 2.165 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:

Easily soluble in cold water, hot water. Soluble in glycerol, and ammonia. Very slightly soluble in alcohol. Insoluble in Hydrochloric Acid.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, high temperatures.

Incompatibility with various substances: Reactive with oxidizing agents, metals, acids.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity:

Hygroscopic. Reacts with most nonnoble metals such as iron or steel, building materials (such as cement) Sodium chloride is rapidly attacked by bromine trifluoride. Violent reaction with lithium.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 3000 mg/kg [Rat.]. Acute dermal toxicity (LD50): >10000 mg/kg [Rabbit]. Acute toxicity of the dust (LC50): >42000 mg/m³ 1 hours [Rat].

Chronic Effects on Humans: MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Lowest Published Lethal Dose (LDL) [Man] - Route: Oral; Dose: 1000 mg/kg

Special Remarks on Chronic Effects on Humans:

Causes adverse reproductive effects in humans (fetotoxicity, abortion,) by intraplacental route. High intake of sodium chloride, whether from occupational exposure or in the diet, may increase risk of TOXEMIA OF PREGNANCY in susceptible women (Bishop, 1978). Hypertonic sodium chloride solutions have been used to induce abortion in late pregnancy by direct infusion into the uterus (Brown et al, 1972), but this route of administration is not relevant to occupational exposures. May cause adverse reproductive effects and birth defects in animals, particularly rats and mice (fetotoxicity, abortion, musculoskeletal abnormalities, and maternal effects (effects on ovaries, fallopian tubes) by oral, intraperitoneal, intraplacental, intrauterine, parenteral, and subcutaneous routes. While sodium chloride has been used as a negative control in some reproductive studies, it has also been used as an example that almost any chemical can cause birth defects in experimental animals if studied under the right conditions (Nishimura & Miyamoto, 1969). In experimental animals, sodium chloride has caused delayed effects on newborns, has been fetotoxic, and has caused birth defects and abortions in rats and mice (RTECS, 1997). May affect genetic material (mutagenic)

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: May cause skin irritation. Eyes: Causes eye irritation. Ingestion: Ingestion of large quantities can irritate the stomach (as in overuse of salt tablets) with nausea and vomiting. May affect behavior (muscle spasticity/contraction, somnolence), sense organs, metabolism, and cardiovascular system. Continued exposure may produce dehydration, internal organ congestion, and coma. Inhalation: Material is irritating to mucous membranes and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations: TSCA 8(b) inventory: Sodium chloride

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):

R40- Possible risks of irreversible effects. S24/25- Avoid contact with skin and eyes.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

Section 16: Other Information

References:

-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II.

Other Special Considerations: Not available.

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Last Updated: 06/09/2012 12:00 PM

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Material Safety Data Sheet



Propane

Section 1. Chemical product and company identification

Product name	: Propane
Supplier	: AIRGAS INC., on behalf of its subsidiaries 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
Product use	: Synthetic/Analytical chemistry.
Synonym	: n-Propane; Dimethylmethane; Freon 290; Liquefied petroleum gas; Lpg; Propyl hydride; R 290; C3H8; UN 1075; UN 1978; A-108; Hydrocarbon propellant.
MSDS #	: 001045
Date of Preparation/Revision	: 4/26/2011.
In case of emergency	: 1-866-734-3438

Section 2. Hazards identification

Physical state	: Gas. [COLORLESS LIQUEFIED COMPRESSED GAS; ODORLESS BUT MAY HAVE SKUNK ODOR ADDED.]
Emergency overview	: WARNING! FLAMMABLE GAS. MAY CAUSE FLASH FIRE. MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CONTENTS UNDER PRESSURE. Keep away from heat, sparks and flame. Do not puncture or incinerate container. May cause target organ damage, based on animal data. Use only with adequate ventilation. Keep container closed. Contact with rapidly expanding gases can cause frostbite.
Target organs	: May cause damage to the following organs: the nervous system, heart, central nervous system (CNS).
Routes of entry	: Inhalation
Potential acute health effects	
Eyes	: Contact with rapidly expanding gas may cause burns or frostbite.
Skin	: Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation	: Acts as a simple asphyxiant.
Ingestion	: Ingestion is not a normal route of exposure for gases
Potential chronic health effects	
Chronic effects	: May cause target organ damage, based on animal data.
Target organs	: May cause damage to the following organs: the nervous system, heart, central nervous system (CNS).
Medical conditions aggravated by over-exposure	: Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.
See toxicological information (Section 11)	

Section 3. Composition, Information on Ingredients

<u>Name</u>	<u>CAS number</u>	<u>% Volume</u>	<u>Exposure limits</u>
Propane	74-98-6	100	ACGIH TLV (United States, 2/2010). TWA: 1000 ppm 8 hour(s). NIOSH REL (United States, 6/2009). TWA: 1800 mg/m ³ 10 hour(s). TWA: 1000 ppm 10 hour(s). OSHA PEL (United States, 6/2010). TWA: 1800 mg/m ³ 8 hour(s). TWA: 1000 ppm 8 hour(s). OSHA PEL 1989 (United States, 3/1989). TWA: 1800 mg/m ³ 8 hour(s). TWA: 1000 ppm 8 hour(s).

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
- Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- Ingestion** : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

- Flammability of the product** : Flammable.
- Auto-ignition temperature** : 450°C (842°F)
- Flash point** : Closed cup: -104°C (-155.2°F). Open cup: -104°C (-155.2°F).
- Flammable limits** : Lower: 2.1% Upper: 9.5%
- Products of combustion** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
- Fire hazards in the presence of various substances** : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.
- Fire-fighting media and instructions** : In case of fire, use water spray (fog), foam or dry chemical.

In case of fire, allow gas to burn if flow cannot be shut off immediately. Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.

Contains gas under pressure. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

- Personal precautions** : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
- Methods for cleaning up** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

- Handling** : Use only with adequate ventilation. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Keep container closed. Keep away from heat, sparks and flame. To avoid fire, eliminate ignition sources. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
- Storage** : Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Segregate from oxidizing materials. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

- Engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.
- Personal protection**
- Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.
- Skin** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
- The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93
- Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
- Personal protection in case of a large spill** : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

Product name

Propane

ACGIH TLV (United States, 2/2010).

TWA: 1000 ppm 8 hour(s).

NIOSH REL (United States, 6/2009).

TWA: 1800 mg/m³ 10 hour(s).

TWA: 1000 ppm 10 hour(s).

OSHA PEL (United States, 6/2010).

TWA: 1800 mg/m³ 8 hour(s).

TWA: 1000 ppm 8 hour(s).

OSHA PEL 1989 (United States, 3/1989).

TWA: 1800 mg/m³ 8 hour(s).

Propane

TWA: 1000 ppm 8 hour(s).

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

Molecular weight	: 44.11 g/mole
Molecular formula	: C3-H8
Boiling/condensation point	: -42°C (-43.6°F)
Melting/freezing point	: -189.7°C (-309.5°F)
Critical temperature	: 96.6°C (205.9°F)
Vapor pressure	: 109 (psig)
Vapor density	: 1.6 (Air = 1)
Specific Volume (ft³/lb)	: 8.6206
Gas Density (lb/ft³)	: 0.116

Section 10. Stability and reactivity

Stability and reactivity	: The product is stable.
Incompatibility with various substances	: Extremely reactive or incompatible with the following materials: oxidizing materials.
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization	: Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Product/ingredient name	Result	Species	Dose	Exposure
Propane	LC50 Inhalation Gas.	Rat	>800000 ppm	15 minutes

IDLH : 2100 ppm

Chronic effects on humans : May cause damage to the following organs: the nervous system, heart, central nervous system (CNS).

Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

Carcinogenic effects : No known significant effects or critical hazards.

Mutagenic effects : No known significant effects or critical hazards.

Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

Not available.

Products of degradation : Products of degradation: carbon oxides (CO, CO₂) and water.

Environmental fate : Not available.




Environmental hazards : This product shows a low bioaccumulation potential.

Toxicity to the environment : Not available.

Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1978	PROPANE	2.1	Not applicable (gas).		<p>Limited quantity Yes.</p> <p>Packaging instruction Passenger aircraft Quantity limitation: Forbidden.</p> <p>Cargo aircraft Quantity limitation: 150 kg</p> <p>Special provisions 19, T50</p>
TDG Classification	UN1978	PROPANE	2.1	Not applicable (gas).		<p>Explosive Limit and Limited Quantity Index 0.125</p> <p>ERAP Index 3000</p> <p>Passenger Carrying Ship Index 65</p> <p>Passenger Carrying Road or Rail Index Forbidden</p> <p>Special provisions 29, 42</p>
Mexico Classification	UN1978	PROPANE	2.1	Not applicable (gas).		-

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Section 15. Regulatory information

United States

U.S. Federal regulations

- : TSCA 8(a) IUR: Partial exemption
- United States inventory (TSCA 8b): This material is listed or exempted.
- SARA 302/304/311/312 extremely hazardous substances: No products were found.
- SARA 302/304 emergency planning and notification: No products were found.
- SARA 302/304/311/312 hazardous chemicals: Propane
- SARA 311/312 MSDS distribution - chemical inventory - hazard identification:
Propane: Fire hazard, Sudden release of pressure
- Clean Air Act (CAA) 112 accidental release prevention - Flammable Substances:
Propane

State regulations

- Clean Air Act (CAA) 112 regulated flammable substances: Propane
- : Connecticut Carcinogen Reporting: This material is not listed.
- Connecticut Hazardous Material Survey: This material is not listed.
- Florida substances: This material is not listed.
- Illinois Chemical Safety Act: This material is not listed.
- Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
- Louisiana Reporting: This material is not listed.
- Louisiana Spill: This material is not listed.
- Massachusetts Spill: This material is not listed.
- Massachusetts Substances: This material is listed.
- Michigan Critical Material: This material is not listed.
- Minnesota Hazardous Substances: This material is not listed.
- New Jersey Hazardous Substances: This material is listed.
- New Jersey Spill: This material is not listed.
- New Jersey Toxic Catastrophe Prevention Act: This material is not listed.
- New York Acutely Hazardous Substances: This material is not listed.
- New York Toxic Chemical Release Reporting: This material is not listed.
- Pennsylvania RTK Hazardous Substances: This material is listed.
- Rhode Island Hazardous Substances: This material is not listed.

Canada

WHMIS (Canada)

- : Class A: Compressed gas.
- Class B-1: Flammable gas.
- CEPA Toxic substances: This material is not listed.
- Canadian ARET: This material is not listed.
- Canadian NPRI: This material is listed.
- Alberta Designated Substances: This material is not listed.
- Ontario Designated Substances: This material is not listed.
- Quebec Designated Substances: This material is not listed.

Section 16. Other information

United States

Label requirements

- : FLAMMABLE GAS.
- MAY CAUSE FLASH FIRE.
- MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
- CONTENTS UNDER PRESSURE.

Canada

Label requirements

- : Class A: Compressed gas.
- Class B-1: Flammable gas.

Propane

Hazardous Material
Information System (U.S.A.)

Health	*	1
Flammability		4
Physical hazards		0

National Fire Protection
Association (U.S.A.)



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet

Version 3.4

Revision Date 03/26/2013

Print Date 03/29/2013

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Sucrose

Product Number : S8501

Brand : Sigma

Supplier : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

Emergency Phone # (For both supplier and manufacturer) : (314) 776-6555

Preparation Information : Sigma-Aldrich Corporation
Product Safety - Americas Region
1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards

No known OSHA hazards

Not a dangerous substance according to GHS.

HMIS Classification

Health hazard: 0

Flammability: 0

Physical hazards: 0

NFPA Rating

Health hazard: 0

Fire: 0

Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.

Skin May be harmful if absorbed through skin. May cause skin irritation.

Eyes May cause eye irritation.

Ingestion May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : α -D-Glucopyranosyl β -D-fructofuranoside
 α -D-Glc-(1 \rightarrow 2)- β -D-Fru
D(+)-Saccharose
Sugar
 β -D-Fructofuranosyl- α -D-glucopyranoside

Formula : C₁₂H₂₂O₁₁

Molecular Weight : 342.30 g/mol

Component	Concentration
-----------	---------------

Sucrose		
CAS-No.	57-50-1	-
EC-No.	200-334-9	

4. FIRST AID MEASURES

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration.

In case of skin contact

Wash off with soap and plenty of water.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water.

5. FIREFIGHTING MEASURES

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products

Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

Avoid dust formation. Avoid breathing vapours, mist or gas.

Environmental precautions

Do not let product enter drains.

Methods and materials for containment and cleaning up

Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling

Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage

Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
Sucrose	57-50-1	TWA	10 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Dental erosion Not classifiable as a human carcinogen			
		TWA	15 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5 mg/m3	USA. NIOSH Recommended Exposure Limits

		TWA	10 mg/m ³	USA. NIOSH Recommended Exposure Limits
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Personal protective equipment

Respiratory protection

Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Eye protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures

General industrial hygiene practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form crystalline

Colour white

Safety data

pH 5.5 - 7 at 342 g/l at 25 °C (77 °F)

Melting point/freezing point Melting point/range: 185 - 187 °C (365 - 369 °F)

Boiling point no data available

Flash point no data available

Ignition temperature no data available

Auto-ignition temperature no data available

Lower explosion limit no data available

Upper explosion limit	no data available
Vapour pressure	no data available
Density	no data available
Water solubility	0.5 g/mL - completely soluble
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability

Stable under recommended storage conditions.

Possibility of hazardous reactions

no data available

Conditions to avoid

no data available

Materials to avoid

Strong oxidizing agents

Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50

LD50 Oral - rat - 29,700 mg/kg

Remarks: Behavioral: Somnolence (general depressed activity). Cyanosis Diarrhoea

Inhalation LC50

no data available

Dermal LD50

no data available

Other information on acute toxicity

no data available

Skin corrosion/irritation

no data available

Serious eye damage/eye irritation

no data available

Respiratory or skin sensitisation

no data available

Germ cell mutagenicity

no data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)

no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)

no data available

Aspiration hazard

no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects

no data available

Additional Information

RTECS: WN6500000

12. ECOLOGICAL INFORMATION

Toxicity

no data available

Persistence and degradability

no data available

Bioaccumulative potential

no data available

Mobility in soil

no data available

PBT and vPvB assessment

no data available

Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

Not dangerous goods

IMDG

Not dangerous goods

IATA

Not dangerous goods

15. REGULATORY INFORMATION

OSHA Hazards

No known OSHA hazards

SARA 302 Components

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards

No SARA Hazards

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Sucrose	57-50-1	1991-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Sucrose	57-50-1	1991-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Sucrose	57-50-1	1991-07-01

California Prop. 65 Components

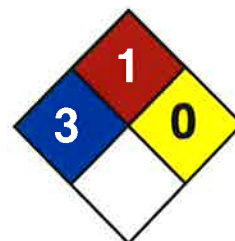
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.



Health	3
Fire	1
Reactivity	0
Personal Protection	H

Material Safety Data Sheet

Oleoresin capsicum MSDS

Section 1: Chemical Product and Company Identification

Product Name: Oleoresin capsicum

Catalog Codes: SLO1051, SLO1291

CAS#: 8023-77-6 (404-86-4)

RTECS: VG7082666 (EY4923000)

TSCA: TSCA 8(b) inventory: Oleoresin capsicum

CI#: Not available.

Synonym: Cayenne Pepper Oil;

Chemical Name: Not available.

Chemical Formula: C₁₈H₂₇NO₃ (capsaicin)

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Oleoresin capsicum	8023-77-6	100
	(404-86-4)	

Toxicological Data on Ingredients: Oleoresin capsicum: ORAL (LD₅₀): Acute: >3000 mg/kg [Rat]. 47.2 mg/kg [Mouse]. DERMAL (LD₅₀): Acute: >512 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:

Extremely hazardous in case of eye contact (irritant). Very hazardous in case of skin contact (irritant), of ingestion, of inhalation (lung irritant). Slightly hazardous in case of skin contact (permeator). Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: These products are carbon oxides (CO, CO₂), nitrogen oxides (NO, NO₂...).

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Section 7: Handling and Storage

Precautions:

Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray.

In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes.

Storage:

Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: Not available.

Color: Not available.

pH (1% soln/water): Not available.

Boiling Point: Not available.

Melting Point: Not available.

Critical Temperature: Not available.

Specific Gravity: Not available.

Vapor Pressure: Not available.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Not available.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

Acute oral toxicity (LD50): 47.2 mg/kg [Mouse]. Acute dermal toxicity (LD50): >512 mg/kg [Mouse].

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans:

Very hazardous in case of skin contact (irritant), of ingestion, of inhalation (lung irritant). Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification:

Identification:

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations: TSCA 8(b) inventory: Oleoresin capsicum

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):

R37/38- Irritating to respiratory system and skin. R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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