

SAFETY DATA SHEET**1. IDENTIFICATION**

Product Identifier: Ammonium Perchlorate
Synonyms: AP, ammonium salt of perchloric acid
Product Code: Reach Registration 01-2119490079-30-0001
SDS compliant with regulations: (EC) No 1907/2006 (REACH), (EC) No 1272/2008 (CLP)
Manufacturer / Supplier: American Pacific
Address: 10622 West 6400 North, Cedar City, UT 84721
Telephone: +1 (435) 865-5000 **Fax:** +1 (435)-865-5005
Emergency Contact: CHEMTREC
Customer Number: CCN721187
US Tel: 1 (800) 424-9300
Int'l Tel: +1 (703) 741-5970

Use of the substance/preparation: Analytical chemistry, oxidizer in various propellant or explosive mixtures, various industrial uses involving need for oxidizing or ionization in aqueous solution properties.

2. HAZARDS IDENTIFICATION**Hazard Classification:**

Oxidizing solids (Category 1), H271
Eye irritation (Category 2A), H319
Specific target organ toxicity - repeated exposure (Category 2), H373

Signal Word: Danger

**Preparation classification:****Physical Hazard:**

Oxidizing Solid 1 H271: May cause fire or explosion; strong oxidizer
EUH044: Risk of explosion if heated under confinement

Health Hazard:

H319: (Eye Irritant 2) Causes serious eye irritation

Specific target organ toxicity:

H373: (STOT Rep. Exp. 2) May cause damage to organs through prolonged or repeated exposure.
Affected organs: thyroid

Precautionary Statements:

P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. Keep away from sparks/open flames/hot surface - no smoking
P220: Keep/Store away from clothing - combustible materials. Keep- Store away from reductive and combustible materials, especially fuels, oils and greases
P260: Do not breathe dust/fume/gas/mist/vapors/spray
P280: Wear protective gloves/protective clothing/eye protection/face protection
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P273: Avoid release to the environment
P370+P378: In case of fire: use water to extinguish.
P371+P380+P375: In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion.

Potential acute health effects:

Eye: irritation, redness, tearing
 Skin: Irritating to mucous membranes and skin
 Inhalation: may cause respiratory tract irritation; coughing, and shortness of breath; high concentrations may cause more significant respiratory effects
 Ingestion: may cause gastrointestinal irritation; larger doses may cause nausea and vomiting.

Potential chronic effects:

Perchlorates act to reversibly and competitively inhibit iodine uptake by the thyroid gland. Perchlorate is soluble in water, so exposure to ammonium perchlorate can be via water contaminated with ammonium perchlorate or inhalation in the workplace.

With chronic exposure given sufficient dose (see (United States National Research Council) NRC, 2005) and duration, ammonium perchlorate can reduce uptake of iodine to the thyroid, which may lead to hypothyroidism. For workers that live in areas of the world with endemic iodine deficiency, it is important that these people receive adequate iodine in the diet or are supplemented with iodine.

Information pertaining to particular dangers for man and environment: May be explosive when mixed with combustible material. There is a risk of explosion if heated under confinement. Specific classification for Ammonium Perchlorate manufactured by American Pacific concerning physical hazards, American Pacific has demonstrated that Ammonium Perchlorate qualities with a median granulometry higher or equal to 70 µm do not present an explosive hazard (application of CLP regulation EC n°1272/2008 - note T) : See 4.14 endpoint study record named "Explosiveness_UN_AmmoniumPerchlorate_AMPAC"

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name: Ammonium Perchlorate

Ingredient Name	Chemical Makeup	CAS#	EC#	%
Ammonium Perchlorate	NH ₄ ClO ₄	7790-98-9	232-235-1	~100

4. FIRST AID MEASURES

As a general rule, in case of doubt or if symptoms persist, always call a physician.

Routes of exposure	Signs and symptoms of exposure:	Emergency and first aid procedures:
Skin:	May cause local irritation or stinging effect.	Wash exposed area immediately with plenty of water. Remove contaminated clothing and footwear.
Inhalation:	Airborne concentrations of ammonium perchlorate can aggravate pre-existing respiratory problems. Chronic exposure may interfere with the uptake of iodine by the thyroid which may cause hypothyroidism.	If experiencing increased respiration or shortness of breath, move to fresh air. Administer oxygen if exposed person is unconscious. Never give anything by mouth to an unconscious person.
Ingestion:	Ingestion of large quantities has been reported to cause staggering in small mammals. Chronic ingestion of sufficient quantities may interfere with uptake of iodine by the thyroid which may cause hypothyroidism.	Give water. Induce vomiting, keep airway clear. Seek medical attention.
Eyes:	Irritation of the eyes will cause stinging effect.	Flush eyes with fresh water for at least 15 minutes and move exposed person to a non-contaminated area.

5. FIRE FIGHTING MEASURES

Flammable properties:

Flash point: not flammable.
 Flash point method: not applicable.
 Auto-ignition temperature: not applicable. Ammonium perchlorate decomposes spontaneously at 300° C in its pure state. Contaminants may cause decomposition at lower temperatures typically down to 270° C but decomposition temperature has been listed as low as 240° C in one case
 Upper flammability limit (volume % in air): not applicable.
 Lower flammability limit (volume % in air): not applicable.

Extinguishing media: Water - other extinguishing materials are ineffective

Unusual fire and explosion hazards: Ammonium Perchlorate is an oxidizing agent and may cause rapid combustion or explosions if mixed with fuels, including organic materials or powdered metals. This does not include dot shipping containers if intimate mixtures are not present and the shipping container is not inordinately contaminated.

Special firefighting precautions/instructions: 1) Do not fight fires involving mixtures of ammonium perchlorate and fuels. Ammonium perchlorate is an oxidizing agent and may cause rapid combustion or explosions if mixed with fuels. 2) Burning ammonium perchlorate may produce chlorine, chlorine dioxide, hydrogen chloride, and oxides of nitrogen as well as mixtures with any other compounds involved in the combustion. These are common by-products of combustion and are likely to be serious health concern; thus, keep upwind or wear self-contained breathing apparatus when attempting to rescue.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Handle the dispersed product wearing protective gloves and glasses as described in section 8.

Environmental precautions: Dispose of waste recovered in accordance with applicable local, state, and federal regulations. Avoid contaminating the environment via the sewers or water sources. Dispose of in accordance with local, state, and federal regulations

Methods for cleaning up: Sweep up material and containerize. Clean contaminated floor surface with water. Move away incompatible products (organic materials, reducing agents).

7. HANDLING AND STORAGE

The regulation relating to storage premises apply to workshops where the product is handled.

Handling:

Handle away from heat and humidity sources (if possible in covered and well ventilated premises).

Avoid contact with incompatible substances (organic materials and reducing agents, especially fuels, oils, greases, etc.).

Avoid contact with eyes and skin (wear appropriate personal protective equipment: glasses, gloves and mask in case of dust).

Prevent any contamination of the environment via the sewers or water sources.

Fire prevention:

Avoid any contamination. Contaminated materials may be sensitive to shocks and friction.

Recommended equipment and procedures:

Store in original closed containers in areas that are specially designated for storage of compatible oxidizers

Prohibited equipment and procedures:

Do not use containers that have not been approved for shipping this particular oxidizer. Refer to relevant transportation codes for the area of use, but is suggested that the UN requirements be met if they are more stringent.

Specific uses:

Analytical chemistry, oxidizer in various propellant or explosive mixtures, various industrial uses involving need for oxidizing or ionization in aqueous solution properties

Storage:

Do not store with reducing agents, organic materials, especially fuels, oils, greases, etc.

Do not store with explosive substances that may detonate.

Do not store close to a heat source that could cause temperatures to approach the decomposition temperature.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

It is always advisable to minimize dusting and use respiratory protection for environments where substantial dust is generated or where there may be exposure to water with high concentrations of perchlorate.

Technical measures:

Ventilate as necessary to minimize dust exposures. Inspect and clean ventilation systems regularly.

Control Parameters:

Ingredient Name	ACGIH	OSHA
Ammonium Perchlorate	TLV/TWA: 10 mg/m ³ (Nuisance Dust)	PEL/TWA 15 mg/m ³ (Nuisance Dust)

EC Exposure Limit Values (human):

Exposure Route	DNEL (worker)	DNEL (population)
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Ingestion	2.2 mg/kg bw/d	20 µg/kg bw/d
Inhalation	0.28 mg/m ³	70 µg/m ³

Exposure controls:

Appropriate engineering controls: Ventilate as necessary to minimize dust exposures. Inspect and clean ventilation systems regularly.

Personal protective equipment:

Skin Protection: Wear impervious aprons or rain gear to reduce contamination of cotton or other fiber clothing. Plastic, rubber or latex gloves are recommended. Leather or cotton gloves should not be used unless a management program is implemented to ensure detection of contamination and immediate cleaning and change in case of contamination. Cotton clothing may be used if chance of contact is minimal or if clothing is monitored for contamination and changed if contamination occurs. In any case where combustible protection is used, a strong management system must be in place to monitor contamination and ensure appropriate removal and cleaning or severe risk of fire and personal injury or death exists. There are no known cloth materials that will not combust vigorously with perchlorates including nomex, Kevlar based materials, or clothing that is normally considered fire retardant or resistive. Observation and management of contamination is the only practicable safety measure.

Hand Protection: Type of glove recommended-Plastic, rubber or latex gloves are recommended. Leather or cotton gloves should not be used unless a management program is implemented to ensure detection of contamination and immediate cleaning and change in case of contamination.

Eye Protection: Under normal conditions, wear safety glasses. Under dusty conditions, wear chemical safety goggles.

Respiratory Protections: Under normal conditions, respiratory protection is not required. Where dusty conditions develop, use a mask or respirator approved by the EC state where this product is used for dusts.

Additional Recommendations: Avoid contamination of cotton or other absorbent material. As in any industrial working environment, workers should routinely wear clean clothes to work. Do not wear any work clothing that has become contaminated with ammonium perchlorate. Remove contaminated clothing immediately and keep wet until thoroughly washed. Keeping contaminated clothing wet minimizes hazards until the laundering is completed. Showering is recommended after handling any industrial chemical. Smoking of tobacco should not be permitted while wearing contaminated clothing. Leather boots may become contaminated and could be a source of combustion damaging feet. Rubber boots are recommended unless a very strict management program to detect contaminated leather boots is in place much as listed on the glove section above.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: White crystal	Physical state: Solid	Molecular weight: 117.50 g/mol	Chemical formula: NH ₄ ClO ₄	Odor: No odor
Specific gravity (water = 1.0): 1.95	Solubility in water (weight %): 20.8 g/100 mL at 20° C	pH: material is a solid however, dissolved in water the pH is slightly acidic	Boiling point: Not applicable, decomposes	Melting point: Decomposes at 300° C in its pure state, impurities may lower the decomposition temperature significantly.
Density: 1.950 g/cm ³	Partition coefficient: noctanol/ Water: No data available	Auto Ignition Temperature: No data available	Upper flammability or explosive limits: Not applicable	Lower flammability or explosive limits: Not applicable
Vapor pressure: solid, not applicable	Vapor density (air = 1.0): not applicable	Evaporation rate: Not applicable	Flash point: Not flammable (Flash point method and additional flammability data are found in Section 5.)	

10. STABILITY AND REACTIVITY

The preparation is stable at the handling and storage conditions recommended per section 7 of this Safety Data Sheet.

Reactivity: Do not mix with organic materials, reducing agents, metal powders or powdered carbon.

Chemical stability: Stable under normal conditions.

Conditions to avoid: Avoid elevated temperatures over 270° C, which can cause spontaneous exothermic decomposition. Cloth fabric of any type including dust collector bags intimately contaminated with ammonium perchlorate is subject to ignition through friction or impact. Water scrubber type dust collection systems are recommended. High-energy static electricity may also serve as an ignition source when contamination or combustibles are intermixed.

Materials to avoid: Sulfuric acid, powdered metals, and intimate mixtures with organics.

Hazardous decomposition products: Chlorine, chlorine dioxide, oxygen, nitrogen oxides, hydrogen chloride.

11. TOXICOLOGICAL INFORMATION

As with any toxicant, assessing dose and exposure are required to understand potential toxicity.

Ammonium perchlorate acts to reversibly and competitively inhibit iodine uptake by the thyroid gland. The half-life of ammonium perchlorate ranges from 8 to 12 hours.

Ammonium perchlorate does not bioaccumulate. Perchlorate is not metabolized and is excreted from the kidneys.

Harmful if swallowed or inhaled in large doses. In the early 1960s another salt of perchlorate, potassium perchlorate, given at 600 to 1000 mg/day for weeks of exposure as an oral therapeutic agent to treat hyperthyroidism was reported to be associated with a few cases of aplastic anemia and agranulocytosis (NRC, 2005). Since that time, there have been no known reports of aplastic anemia. There have been no reports of ammonium perchlorate associated with aplastic anemia or agranulocytosis.

Immediate (acute) effects:

Oral LD₅₀: rat; 4200 mg/kg Rat-par-LDLo = 3500 mg/kg

Oral LD₅₀: rabbit; 1900 mg/kg

Inhalation LC₅₀: No references found.

Skin sensitization: not reported to be a skin sensitizer

Delayed (subchronic and chronic) effects:

Thyroid: No long-term health effects have been reported with worker exposure to ammonium perchlorate.

Perchlorate is water soluble; exposure to ammonium perchlorate can be via water contaminated with ammonium perchlorate or inhalation in the workplace. With chronic exposure, sufficient dose, and duration, ammonium perchlorate may reduce uptake of iodine to the thyroid, which may lead to goiter (enlarged thyroid gland) and hypothyroidism. Occupational studies indicated no adverse health effects on workers exposed for 3 years or more to perchlorate. These studies also demonstrate that blood chemistry and hormone values are not altered with occupational exposures as high as 0.48 mg per kilogram body weight (Braverman et al., 2005; Lamm et al., 1999). In 2005, a United States National Academies of Science (NAS) Committee comprehensively reviewed the literature related to oral exposures of perchlorate and reported that “to cause declines in thyroid hormone production that would have adverse health effects, iodide uptake would most likely have to be reduced by at least 75% for months or longer” and “...the perchlorate dose required to cause hypothyroidism in adults would probably be more than 0.40 mg/kg per day, assuming a 70-kg body weight” (NAS, 2005). The NAS also identified a no-observed-effect-level of 0.007 mg/kg/day in humans, based on Greer et al. 2002, which is a dose that does not cause inhibition of iodide uptake. This is further supported by a small study in which no effect on thyroid function was reported with six months of exposure up to 3 mg/d (Braverman et al., 2006). For workers that live in areas of the world with endemic iodine deficiency, it is important that these people receive adequate iodine in the diet or are supplemented with iodine.

Carcinogen:

IARC: NO

NTP: NO

OSHA: NO

Reproductive:

In 2005, the California Environmental Protection Agency’s Office of Environmental Health Hazard Assessment (OEHHA) Developmental and Reproductive Toxicology Identification (DART) Committee concluded that available scientific information on perchlorate was not sufficient for placing the substance on a list (Prop 65) list of chemicals known to the State of California to cause birth defects or other reproductive harm.

Immunology:

Immunotoxicity studies in mice revealed no changes in immunologic function in response to perchlorate exposure (Keil et al. 1998, 1999).

Other Medical conditions aggravate by exposure:

Excessive dust inhalation can aggravate respiratory conditions

12. ECOLOGICAL INFORMATION

Toxicity Data:

Daphnia Magna Acute 48-hour LC₅₀ 490 mg/l water with sodium perchlorate
PimephalesPromelas Acute 96 hour LC₅₀ 1655 mg/l water with sodium perchlorate
CeriodaphniadubiaChronic 6 day LC₅₀ 77.8 mg/l water with ammonium perchlorate
PimephalespromelasSubchronic 7 day LC₅₀ 270 mg/l water with ammonium perchlorate
Lатуca Sativa Subchronic 7 day LC₅₀ 614 mg/kg soil
EiseniaFoetida Acute 7 day LC₅₀ 4450 mg/kg soil

Persistence and degradability:

Perchlorate ion is persistent but can be decomposed by naturally occurring bacteria in anoxic conditions in the presence of a suitable electron donor.

Bio-accumulative potential:

Perchlorate has a half-life of approximately 8-12 hours and is excreted unchanged, mostly in urine. Perchlorate does not bio-accumulate (NAS, 2005).

13. DISPOSAL CONSIDERATIONS

The generation of waste should be avoided or minimized wherever possible. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements.

Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

The information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

Is the unused product a RCRA hazardous waste if discarded? Yes –if discarded as a solid and not in solution. If discarded as a solution carefully evaluate before any determination of waste status to avoid misinterpretation. Caution: Intentionally placing solid material into solution to dispose of it may violate several regulations if not managed carefully thereafter. Various states have local regulations that are applicable and are changing. Evaluate carefully all applicable regulations for your location before determining status and method of disposal!

If yes, the RCRA ID number is: D001

The information offered in section 13 is for the product as shipped. Use and/or alterations to the product such as mixing with other materials may significantly change the characteristics of the material and alter the RCRA classification and the proper disposal method.

Follow all rules and recommendations of the EC member state in which product is used.

Ammonium perchlorate should be disposed as a solid to either a hazardous waste landfill, in the US. Similar regulations apply to the EU and other parts of the world. Do not dispose of ammonium perchlorate where it is likely to contact water and dissolve and then enter the environment. Verify the local state (country) requirements where the material is sited before disposing. If transported to another country (state), additional regulations may apply. In any case, manage disposal to protect persons and the environment.

The information offered in section 13 is for the product as shipped. Use and/or alterations to the product such as mixing with other materials may significantly change the characteristics of the material and alter the RCRA classification and the proper disposal method.

14. TRANSPORT INFORMATION

Proper Shipping Name:

Ammonium perchlorate

Document Title: Ammonium Perchlorate Safety Data Sheet

Ammonium perchlorate manufactured by American Pacific meets the 5.1 Oxidizer classification UN Number 1442, Packing Group 2. The product is shipped with a 5.1 oxidizer label. American Pacific does not manufacture material with nominal granulometry less than 70 µm.

UN Number: UN1442	Proper Shipping Name: Ammonium Perchlorate	US DOT Hazard Class: Oxidizer 5.1	Pack Group: II	UN1442, Ammonium Perchlorate, 5.1, II	Classification Code: O2
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Additional transport information:

For additional information on shipping regulations affecting this material, contact the information number found in Section 1. Note: AMPAC, the parent of Western Electrochemical Co. Division has performed tests as required and applied to DOT and received approvals listed at the right for various grades of AP as 5.1 oxidizer as shown to the right. Other AP does not automatically meet this classification and would require testing and DOT approval to achieve a 5.1 oxidizer class. These exemptions are specific to the facility located at 10622 West 6400 North, Cedar City, Utah 84720 Ammonium perchlorate Propellant grade 170 micron and greater has received classification as a 5.1 oxidizer under EX 2003110036.

Ammonium perchlorate propellant grade with average particle size of 70 microns and larger; Ammonium perchlorate wetted with not less than 5% water, and Ammonium perchlorate, non-propellant grade, with average particle size 70 microns and larger has received classification as a 5.1 oxidizer under EX2004020234. Both exemptions have container and weight restrictions and are not directly transferable to any other parties without application to and approval of DOT through the RSPA office or its successor office.

Environmental Hazards: Please see section 12. Prevent any contamination of the environment via the sewers or water sources.

Special precautions for user: Please see section 7

15. REGULATORY INFORMATION

U.S. Federal regulations:

TSCA: CAS# 7790-98-9 is listed on the TSCA inventory.

SARA 302/304/311/312 extremely hazardous substances: None of the chemicals in this product have a TPQ.

SARA 302/304 emergency planning and notification: No products were found.

SARA 302/304/311/312 hazardous chemicals: No products were found.

Clean Water Act (CWA) 307: No products were found.

Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 accidental release prevention: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

This preparation was classified in compliance with the following directives and regulations:

(EC) No 1907/2006 (REACH)

(EC) No 1272/2008 (CLP)

(EC) No 453/2010

Hazard symbols:

O Oxidizing

Risk phrases:

EUH044: Risk of explosion if heated under confinement

Safety Statements:

S17: Keep away from combustible material

S36/37: Wear suitable protective clothing and gloves

S16: Keep away from sources of ignition - No smoking

S14: Keep away from ... (incompatible materials to be indicated by the manufacturer).

A Chemical Safety Assessment has been conducted for ammonium perchlorate.

STATE RIGHT-TO-KNOW In addition to the ingredients found in Section 2, the following are listed for state right-to-know purposes.		
Ingredient Name	SARA/CERCLA RQ (lbs)	SARA EHS TPQ (lbs)
Ammonium Perchlorate	Examine local regulations to determine	Examine local regulations to determine

Due to the changing regulatory environment in individual states, it is very difficult to maintain up to date information for each state in a material safety data sheet. The user must examine the local regulations in force and comply with all requirements.

Information about limitation of use: For use only by technically qualified individuals.

United States OSHA: Ammonium perchlorate is on the list of process safety management chemicals with a threshold quantity of 7500 pounds 29 CFR 1910.119.

16. OTHER INFORMATION

Not for Food or Drug Use. The user is responsible to evaluate the safety and environmental consequences of any intended uses. The manufacturer assumes no liability for any usages that result in adverse consequences.

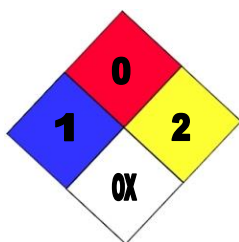
Additional Classification Systems:

Hazardous Materials Identification System (HMIS) ratings (scale 0 – 4)

Health Hazard	1
Fire Hazard	0
Reactivity	2
PPE	X

X - Consult your supervisor or S.O.P. for SPECIAL handling directions

National Fire Protection Association (NFPA) ratings (scale 0 – 4)



IMPORTANT: The information presented herein, while not guaranteed, was prepared by competent technical personnel and is true and accurate to the best of our knowledge. **NO WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, IS MADE REGARDING PERFORMANCE, STABILITY OR OTHERWISE.** This information is not intended to be all-inclusive as to the manner and conditions of use, handling and storage. Other factors may involve other or additional safety or performance considerations. While our technical personnel will be happy to respond to questions regarding safe handling and use procedures, safe handling and use remains the responsibility of the customer. No suggestions for use are intended as, and nothing herein shall be construed as a recommendation to infringe any existing patents or violate any Federal, Other National Governmental Entity, State, Provincial, or local laws.

References:

Braverman, L.E., He, X., Pino, S., Cross, M., Magnani, B., Lamm, S.H., Kruse, M.B., Engel, A., Crump, K.S., Gibbs, J.P. 2005 The effect of perchlorate, thiocyanate, and nitrate on thyroid function in workers exposed to perchlorate long-term. *J. Clin. Endocrinol.Metab.* 90: 700–706.

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Document Title: **Ammonium Perchlorate Safety Data Sheet**

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