

ACETONE

DATA SHEET

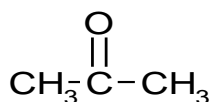
Description

Acetone (or Dimethyl ketone) is a clear, colorless, low boiling, flammable, volatile liquid, characterized by rapid evaporation and a faintly aromatic, sweetish odor. It is readily miscible in most organic solvents and completely miscible, in all proportions, in distilled water.

Acetone is both the simplest and most important of the aliphatic ketones. It is an excellent solvent for a wide range of gums, resins, waxes, fats, greases, oils, dyestuffs and cellulose.

It is widely used as a chemical intermediate in the production of methyl isobutyl ketone and other solvents, and in the production of such important chemicals as bisphenol A and methyl methacrylate. It is also used in the manufacture of a wide variety of coatings and plastics.

This brochure discusses physical and chemical properties, applications, and recommendations for safe handling, use, and storage of acetone.



Acetone, 2-Propanone, Dimethyl Ketone.
CAS Registry Number 67-64-1

Uses

AS A SOLVENT

As a solvent, acetone is frequently incorporated in solvent system or "blends", especially as the low boiling component of "high-low" blends. Many of these acetone-solvent blends are used in the formulation of "high-solid" cellulose ester lacquers for automotive and furniture finishes. They are also used in acrylic automotive lacquers, particularly when the acrylics are modified with nitrocellulose. Acetone, which has a dilution ratio of 4.5, may be used to reduce the viscosity of lacquer solutions.

Significant amounts of acetone are used in the manufacture of cellulose acetate films and in the casting of photographic films and plates. Acetone is used as a solvent for vinylidene chloride-acrylonitrile coating resins, permitting barrier coatings as thin as 0.1 mil to be applied with ease to various films and foils. The high volatility and consequent cooling effect of this solvent are especially desirable if the substrate is heat sensitive. Acetone is widely used as a solvent in the polyester resin industry, as both a resin thinner and for clean up operations. It also is frequently used in paper coatings and as a solvent for inks.

Acetone is included in the solvent systems of general purpose nitrocellulose cements and neoprene industrial adhesives. It is used as the basic solvent for nitrocellulose heat-seal coatings, as the primary solvent in vinyl type grease-resistant heat-seal coatings, and pressure sensitive chlorinated rubber adhesives. Acetone based cements may be used to provide an effective bond for cellulose ethers.

CLEANING FLUIDS

Acetone is widely used in the textile industry for degreasing wool and degumming silk. Also, large quantities are used in paint, lacquer, and varnish stripping compounds, and in nail polish removers. In addition, acetone is used as efficient degreasing agent for cleaning electronic components and vacuum tubes.

OTHER SOLVENT USES

Other solvent uses include preparation of explosives, manufacture of cellulose acetate fibers, and formulation of denatured alcohol. Since acetone absorbs many times its own volume of acetylene gas, it is possible to ship acetylene safely in cylinders by using acetone as the solvent. Acetone also finds many applications as a drying agent or as an extracting or purifying agent.

AS A CHEMICAL INTERMEDIATE

The amount of acetone used annually in the production of other chemicals is increasing. For example, the production of derivative solvents now accounts for approximately one-third of the total acetone market. Large amounts are used in the production of methacrylates and bisphenol A, and in the production of acetone amines, which serve as antioxidants for rubber, ketone, and various cosmetic products.

Sales specification

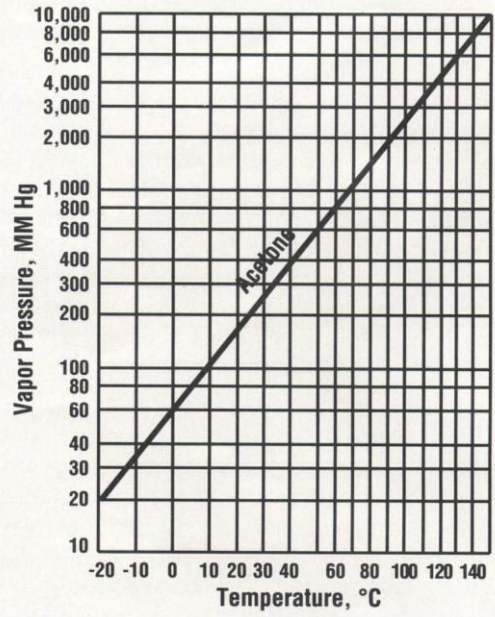
Property	Unit	Value	Test method
Appearance		Colorless liquid	Visual
Color	Pt-Co	5 max.	ASTM D 1209
Specific gravity at 20/20 °C		0.790 ~ 0.793	ASTM D 4052
Water content	% wt	0.3 max.	ASTM D 1364
Water miscibility		Complete	ASTM D 1722
Acidity as acetic acid	% wt	0.002 max.	ASTM D 1613
Permanganate test	minutes	120 min.	ASTM D 1363
Non-volatile matter	g / 100ml	0.001 max.	ASTM D 1353
Distillation range	°C	1.0 max. from start to dry, incl. 56.1	ASTM D 1078
Purity	% wt	99.5 min.	ASTM D 1353

● Purity, % wt = 100 % wt - (water content, % wt + Total G.C impurities, % wt)

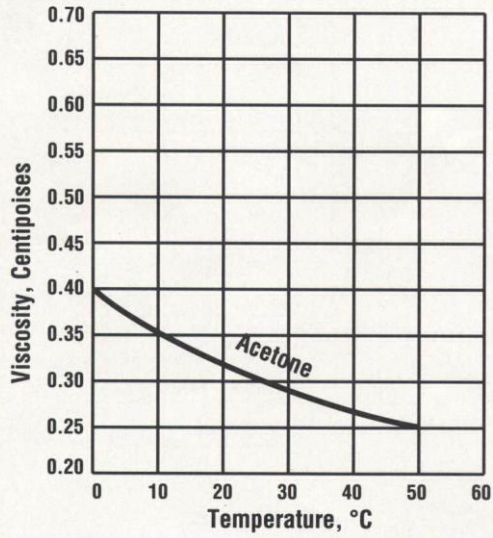
Typical Properties of Acetone

Property	Unit	Value
Appearance		Colorless liquid
Autoignition temperature	°C	465(869°F)
Boiling point(760mm)	°C	56.2(133.2°F)
Density at 20°C	g / ml	0.7898(6.59 lb/gal)
Electrical conductivity at 25°C	Ohm ¹ cm ¹	5.5 × 10 ⁸
Empirical formula		CH ₃ COCH ₃
Evaporation rate(Butyl Acetate = 1)		> 7.0
Flammable limits at 25°C	Vol. %	2.15 - 13
Flash point		
Open Cup	°C	- 20
Closed Cup		- 9.0
Heat of Combustion	Kcal/mole	427
	cal/g	7,362
	Btu/mole	1,691
	Btu/lb	13,240
	Btu/gal	87,119
Heat of Combustion	Kcal/mole	1.358
	cal/g	23.4
	Btu/mole	0.092
	Btu/lb	5.377
	Btu/gal	42.0
Heat of vaporization at 56.1°C	Kcal/kg	-122
Melting point	°C	-95.35
Molecular weight		58.08
Odor		Pleasant, faintly, aromatic, sweetish
PH		Approx. 7 (1 vol. Acetone in 1 vol. Water)
Refractive index n ₂₀ /D		1.359
Solubility in water	% wt	Complete
Specific gravity at 20/4 °C		0.7920
10/20 °C		0.8025
15/20 °C		0.7968
20/20 °C		0.7911
25/20 °C		0.7854
30/20 °C		0.7797
Surface tension at 0 °C	Dynes/cm	26.2
20 °C		23.7
40 °C		21.2
Vapor pressure at 0 °C	mmHg	69.2
20 °C		181.0
30 °C		282.5
40 °C		420.5
56.1 °C		760.0
Viscosity at 0 °C	cps	0.401
20 °C		0.331
50 °C		0.256

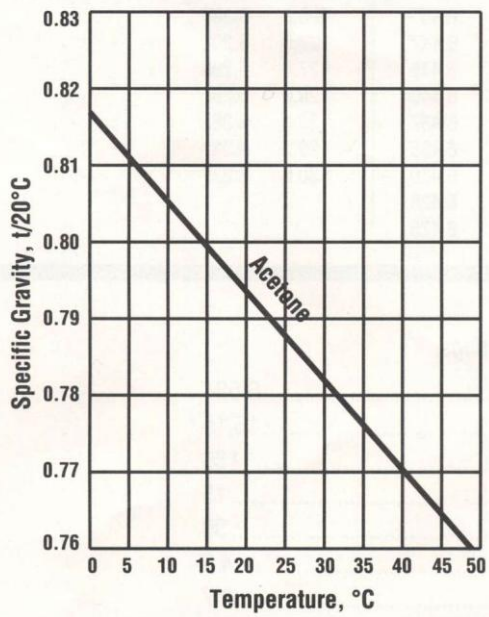
Vapor Pressure of Acetone



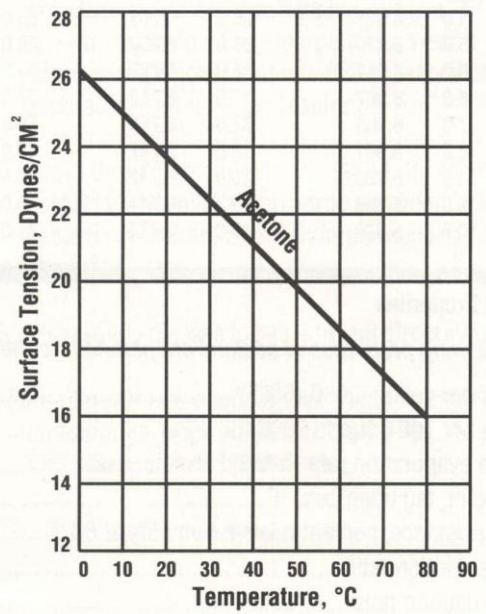
Viscosity of Acetone



Specific Gravity of Acetone



Surface Tension of Acetone



Typical Materials Dissolved by Acetone

Gums, waxes, and natural resins Colophony Coumarone Coumarone-Indene Dammar(dewaxed) Elemi Manila Pontianac Rosin Sandarac	Rubbers and polymers Alkyd, Non-drying Type Alkyd, Maleic Modified Alkyd, Maleic-Rosin Modified Cellulose Acetate Cellulose Acetate Butyrate (Low Butyryl) Cellulose Acetate Butyrate (High Butyryl) Cellulose Acetate Propionate (Low Propionyl) Cellulose Acetate Propionate (High Propionyl)	Rubbers and polymers-cont. Chlorinated Diphenyl Epoxy Ethyl Cellulose Methyl Methacrylate Nitrocellulose Phenolic Polyurethane Polyvinyl Acetate Urea-Formaldehyde Vinyl Chloride-Vinyl Acetate Copolymer Vinyl Chloride-Vinyl Acetate Copolymer, Maleic Modified Vinyl Chloride-Vinyl Acetate Copolymer, Vinyl Alcohol Modified Vinyl Chloride-Vinylidene Chloride Copolymer Vinylidene Chloride Acrylonitrile Copolymer
Synthetic resins Acrylonitrile-Butadiene(NBR)	Oils Almond Castor Chinawood(Tung) Coconut Cottonseed Fish Linseed Mineral Pine Rapeseed Soybean	

Density Tabel of Acetone at Various Temperatures

°C	g/cm ³	°C	g/cm ³	°C	g/cm ³	°C	g/cm ³
0	0.812						
1	0.811	11	0.801	21	0.790	31	0.778
2	0.810	12	0.800	22	0.789	32	0.777
3	0.809	13	0.799	23	0.788	33	0.776
4	0.808	14	0.797	24	0.786	34	0.775
5	0.807	15	0.796	25	0.785	35	0.774
6	0.806	16	0.795	26	0.784	36	0.773
7	0.805	17	0.794	27	0.783	37	0.771
8	0.804	18	0.793	28	0.782	38	0.770
9	0.803	19	0.792	29	0.781	39	0.769
10	0.802	20	0.791	30	0.780	40	0.768

STORAGE

Carbon steel tanks are recommended for acetone service. The design should be positive pressure, plus 6" water, minus 1/2 ounce. Recommended gaskets include DURABLA-G-4 ASP(80% asbestos fiber with rubber binder) or Teflon.

Additional design considerations are regulated by the National Fire Prevention Association. These considerations include location, method of sizing, emergency relief valve system, type of drainage diking, and additional fire protection considerations. Consult local fire codes for additional fire protections. Consult local fire codes for additional fire protection requirements which might include combustible gas monitors, location of fire monitor nozzles, or foam and sprinkling systems.

Acetone should be stored under an inert gas pad such as nitrogen. Carbon dioxide is not recommended. A blanketing or pad/depad system is recommended to maintain the inert atmosphere. The associated tank venting system is discussed in the section on accessory equipment.

Storage tanks containing acetone should be properly grounded. Pumps utilized for both filling and removal of material from the tank should share a common ground with the tank. Locate these pumps outside the tank diking area.

To minimize the possibility of static charge build up during filling of the tank, the following additional construction design is recommended.

The tank inlet nozzle should be at the bottom of the vessel with provisions to block and drain piping. If the tank inlet nozzle is installed at the top of the tank side wall, a carbon steel tube located in the interior and directed to the tank bottom should be connected to the inlet nozzle. This should then extend from the inlet nozzle to near the tank bottom, resting on supports on, but not welded to, the tank bottom. Acetone pumped into inlet nozzle will then flow through the interior tube and enter the tank contents at the tank bottom. A small hole should be drilled in the tube near the inlet nozzle to prevent a possible siphoning effect. The tank exterior should be painted a light, reflective color, such as white.

Local fire, pollution, and any additional regulations affecting bulk handling and storage of acetone should be consulted.

SAFETY CONSIDERATIONS

Toxicity

Acetone has low toxicity potential relative to other commonly used industrial solvents. There have been no confirmed reports that prolonged inhalation of low vapor concentrations results in any chronic effects in man. High vapor concentrations may produce anesthesia and may be irritating to the eyes, nose, and throat. Also, direct contact of acetone with the eyes may produce moderate irritation and moderate corneal injury; prolonged or repeated skin contact with the liquid may cause mild irritation.

INDUSTRIAL HYGIENE

Guidelines For Vapor Control

The American Conference of Governmental Industrial Hygienists(ACGIH) has adopted a 750 ppm Threshold Limit Value(TLV) for acetone for an 8-hour Time Weighted Average(TWA) exposure. The Occupational Safety and Health Administration PEL(Permissible Exposure Limit) for acetone is 750 ppm and the STEL(Short-Term Exposure Limit) is 1000 ppm

FIRST AID

The chance of exposure to acetone can be minimized by careful attention to industrial hygiene and adherence to safe work practices. However, plant personnel should be prepared to give effective first aid in the event of accidental spills or exposure.

Inhalation

- Remove the affected person immediately from the contaminated area. Keep person warm and quiet.
- Call a physician at once.
- If breathing stops or is irregular, administer mouth-to-mouth resuscitation.

Skin Contact

- Remove all contaminated clothing immediately and wash skin thoroughly with soap and water for at least 15 minutes.
- Wash clothing before reuse.
- If skin irritation or injury develops, seek medical attention.

Eye Contact

Flush the eyes immediately and continuously with plenty of flowing water for at least 15 minutes. Seek medical attention immediately.

Ingestion

Call a physician at once. If large amounts are swallowed and patient is conscious and not having convulsions, induce vomiting. Never give fluids or induce vomiting if patient is unconscious or having convulsions.

SPILLS AND DISPOSAL

Wear appropriate safety equipment. Keep spills away from heat, sparks, or flames. Soak up the acetone with an absorbent material and scoop into drums. Large spills should be diked and pumped into drums using air operated or other non-spark-producing pump. Prevent acetone from entering drains and sewers. In disposal of any wastes, be certain that all applicable federal, state, and local regulations are met.

Note: Although acetone is noncorrosive to metals, it will dissolve many plastics.

FIRE AND EXPLOSION

Since acetone is a flammable liquid, with a closed cup flashpoint of -20°C (-4°F), it must be kept away from heat, sparks, or flames. It should be used with adequate ventilation, and stored in closed containers. Fires may be controlled with carbon dioxide, dry chemical extinguishers or alcohol foam. Water can be used to cool fire-exposed containers, to protect personnel, and to disperse vapors and spills. Fire fighters should wear protective clothing and self-contained positive pressure breathing apparatus.

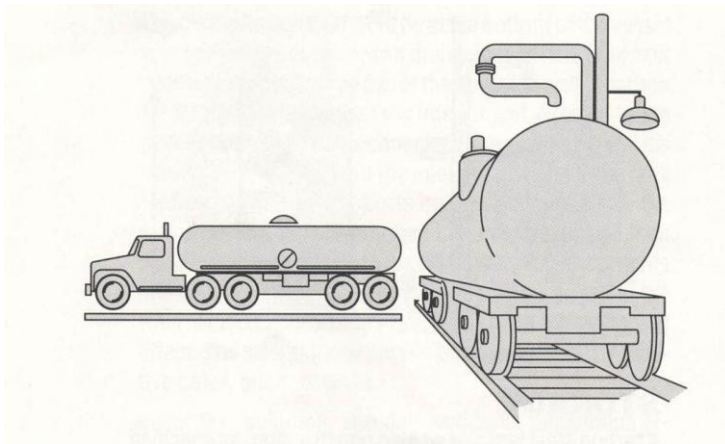
The flammable limit at room temperature is between 2.6 and 12.8 volume percent acetone vapor in air. Acetone may react vigorously with certain oxidizing agent such as chromic acid and alkaline potassium permanganate.

UNLOADING

Unloading personnel should be familiar with general tank car and tank equipment, be thoroughly instructed as to the hazardous properties of acetone, and be trained in the proper use of required protective equipment.

The acetone storage tank should have an inert gas(nitrogen) pad. This receiving tank should be vented back to the tank car or tank truck by means of a line from the top of the storage tank to the tank car or tank truck. This closed loop system prevents exposure to personnel and the formation of potentially explosive mixtures.

Transfer of the acetone from the tank car or tank truck can then be accomplished by means of a pump. Both the tank car or tank truck and the transfer pump must be grounded.



ACETONE TANK TRUCK UNLOADING PROCEDURE (PACKING)

A written job procedure on unloading tank trucks of acetone should be provided to anyone performing this operation. The following procedure gives minimum requirements for unloading tank trucks of acetone.

1. Emergency respiratory equipment, a safety shower and eye bath, a fire extinguisher, and the necessary personal protective equipment should be available to persons unloading tank trucks of acetone.
2. Visually check area for leaks and other hazards. Remove all obstructions.
3. Spot truck. Secure keys and/or placard wheel.
4. Chock wheels and hook up ground cable.
5. Inspect truck. Check all truck openings for tight seal. Check all valves and gaskets in quick fits. Visually check trucks for other hazards. CAUTION : Do not walk or work on top of tank truck without platform and handrails or life line to prevent falls.
6. Through the loading hatch on top of the tank truck, collect a small sample and analyze to verify contents of the truck. Be sure to use safety equipment(neoprene rubber gloves, monogoggles, respirator, spark proof tools and sample tongs). Tank sample from dome of the truck.
7. The acetone storage tank should have an inert gas pad. This receiving tank should be vented back to the tank truck by means of a line from the top of the tank to the tank truck.
8. Connect the unloading hoses. NOTE : This completes the closed loop system. See figure below.
9. Line up all valves at truck an tank.

10. Notify operations of transfer.
11. Obtain accurate tank readings. Check to make sure tank will hold truck content, then start pumping. Limit the pumping rate of the plant pump or truck to a level which will prevent a vacuum from developing in the tank truck.
12. Double check lines, truck, and tank for leaks and/or proper line up. One person must be within 25 feet of truck while unloading.
13. When truck is empty, shut off pump, isolate tank truck from storage tank, and then close or open appropriate valves.
14. Transfer hose must be bled down before any attempt to disconnect. After pressure is bled off, disconnect hose and vent line.
15. Remove wheel chocks, ground cable, and return key. Do not reverse placards.
16. Release truck.

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