

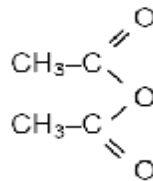
# Acetic Anhydride

Acetic Acid Anhydride

Ethanoic Anhydride

CAS no. 108-24-7

EC no. 203-564-8



### Product description

Acetic Anhydride is a clear, colorless liquid with a very pungent, penetrating, vinegar-like odor. It is completely miscible with diethyl ether and can be easily dissolved in the usual organic solvents; it reacts with alcohols. Acetic Anhydride is an excellent solvent for numerous organic and inorganic products.

In the presence of water, Acetic Anhydride reacts slowly at room temperature to form acetic acid. At moderate and elevated temperatures, however, this reaction can be extremely exothermic and violent. It is accelerated by catalytic quantities of sulfuric acid or other mineral acids and may even be explosive.

### Product Manufacturing

Acetic anhydride is produced through the Ketene route process, using acetic acid as raw material:



Acetic Acid      Ketene



Ketene      Acetic Acid      Acetic Anhydride

### Possible Applications

In the chemical industry, the reactivity of the acetyl group of Acetic Anhydride is used to synthesize end products and intermediates.

Acetic Anhydride is widely employed industrially for its acetylating and dehydrating properties. A major use for it is the acetylation of cellulose to produce acetate fibers, plastics, coatings and films. It is especially valuable for the direct esterification of alcohols where acetic acid cannot be used.

Another large use for Acetic Anhydride is in the manufacture of acetylsalicylic acid (aspirin), acetylcholine hydrochloride, acetophenetin, sulfonamides, aceto-p-aminophenol, cortisone, acetanilide, theophylline, sulfa drugs, certain vitamins and hormones; and many other pharmaceuticals and pharmaceutical intermediates.

# Product Description and Handling Guide

## Acetic Anhydride



Acetic Anhydride is also used to produce acetyl ricinoleates, triacetin, acetyl tributyl citrate, and other plasticizers. Triacetic glycerol esters are used as plasticizers in the plastics and paint industry, as fixatives in perfumery and as solvents for fungicides and basic dyes.

Acetylated fatty acid monoglycerides and acetylated animal and vegetable fats are used as additives and auxiliaries in the food industry. In this connection, the relevant statutory food regulations must be observed.

Another chemical use is in the manufacture of acetyl peroxide. Acetic Anhydride is also used as an intermediate in the manufacture of explosives, weed killers and in the chemical treatment of papers and textiles

### Physical Properties

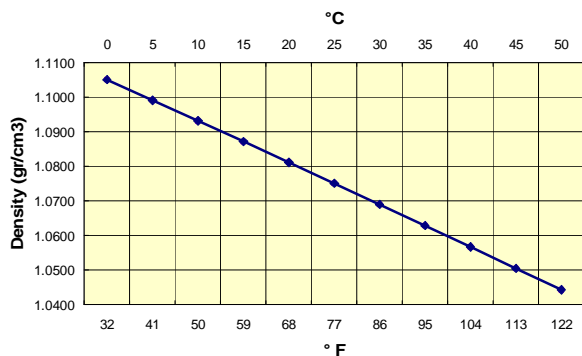
<i>Typical Properties</i>		<i>Unit</i>	
Boiling point at 1 Atm. (1013 hPa)		°C	139.5
Coefficient of Thermal Expansion at 20 °C			$1.12 \times 10^{-3}$
Critical Pressure		Kg/cm <sup>2</sup>	40.8
Critical Temperature		°C	332.8
Dielectric Constant at 20 °C			20.5
Evaporation rate (n-Butyl Acetate = 1)			0.46
Heat of Vaporization	at 20 °C	BTU/lb	205.7
	at 30 °C	BTU/lb	203.0
	at 50 °C	BTU/lb	197.6
Liquid Heat Capacity	at 20 °C	BTU/lb/°F	0.436
	at 30 °C	BTU/lb/°F	0.448
	at 50 °C	BTU/lb/°F	0.472
Liquid Thermal Conductivity	at 20 °C	BTU/ft/sec/°F	$2.65 \times 10^{-5}$
	at 30 °C	BTU/ft/sec/°F	$2.62 \times 10^{-5}$
	at 50 °C	BTU/ft/sec/°F	$2.54 \times 10^{-5}$
Melting temperature		°C	- 83.55
Molar mass		g/mol	102.09
Solubility in water			hydrolyses
Surface Tension	at 20°C	dynes/cm	32.7
	at 30°C	dynes/cm	31.2
	at 50 °C	dynes/cm	28.3
Vapor density (Air =1)			3.5

# Product Description and Handling Guide

## Acetic Anhydride

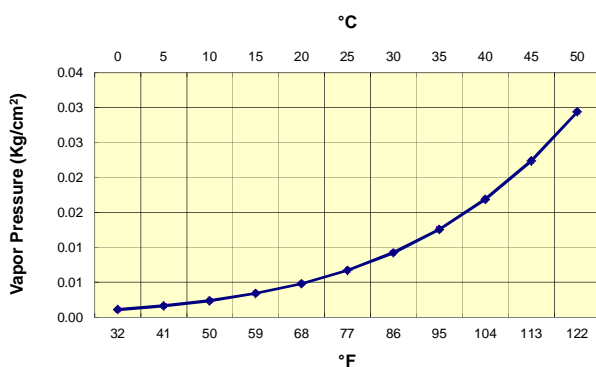


Acetic Anhydride - Liquid Density (g/cm<sup>3</sup>)



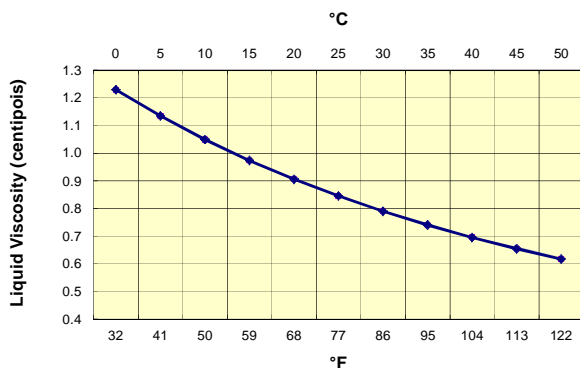
° F	° C	Liquid Density (g/cm <sup>3</sup> )
32	0	1.1051
41	5	1.0991
50	10	1.0932
59	15	1.0872
68	20	1.0811
77	25	1.0751
86	30	1.0690
95	35	1.0628
104	40	1.0567
113	45	1.0505
122	50	1.0442

Acetic Anhydride - Vapor Pressure (Kg/cm<sup>2</sup>)



° F	° C	Vapor Pressure (Kg/cm <sup>2</sup> )	hPa
32	0	0.001	1.1
41	5	0.002	1.6
50	10	0.002	2.3
59	15	0.003	3.3
68	20	0.005	4.7
77	25	0.007	6.6
86	30	0.009	9.1
95	35	0.013	12.3
104	40	0.017	16.5
113	45	0.022	22.0
122	50	0.029	28.8

Acetic Anhydride - Liquid Viscosity (centipois)



° F	° C	Liquid Viscosity (centipoise or mPa.s)
32	0	1.23
41	5	1.13
50	10	1.05
59	15	0.97
68	20	0.91
77	25	0.85
86	30	0.79
95	35	0.74
104	40	0.70
113	45	0.65
122	50	0.62

Data are intended for the purpose of product description and are not the subject of continuous monitoring. Further physical properties and characteristic data as well as information on safety and handling are listed in the material safety data sheet and the sales specifications. Please consult [www.celanese.com](http://www.celanese.com)

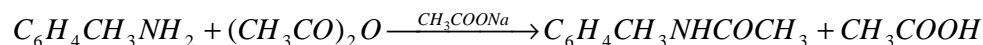
# Product Description and Handling Guide

## Acetic Anhydride

### Chemical Reactions

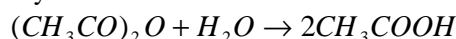
The reactions of Acetic Anhydride are those of a typical acid anhydride.

1. Acetylation



2. Conversion into acids and acid derivatives

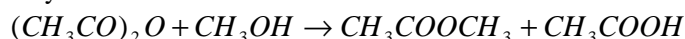
(a) Hydrolysis into acetic acid



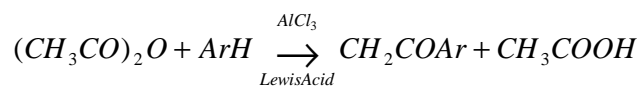
(b) Ammonolysis into acetamide



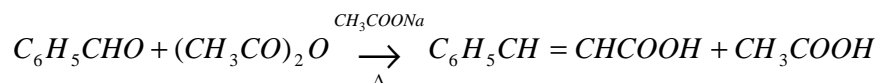
(c) Alcoholysis into esters



3. Formation of ketones by Friedel-Crafts acylation



4. Condensation Reactions (Perkin)



### Shelf life

The shelf life of Acetic Anhydride is one year. The shelf life dates from the day of packaging for small containers; for bulk product, it is the day of loading. This period is in general applicable to material stored under recommended conditions (see Storage and Handling sections). When product exceeds its shelf life or storage deviates from the recommended conditions, periodic monitoring may be required to verify quality status of the product.

### Storage

Recommended Blanketing	Air <sup>1,2</sup> or Dry Nitrogen <sup>3</sup>
Recommended Temperature	Ambient
Recommended pressure	Atmospheric
Bulk Quantities	Outside, detached tanks
Small Containers	Cool, dry, well ventilated area

1. Refer to NFPA #77 "Static Electricity" for proper electrical grounding procedures.
2. See the National Fire Protection Agency (NFPA) #30 "Flammable and Combustible Liquids Code" and consult with qualified fire protection specialists to determine specific storage tank design requirements.
3. Blanketing may be used to retain quality in long-term storage conditions.

# Product Description and Handling Guide

## Acetic Anhydride



### Handling

- Thoroughly review Material Safety Data Sheet before handling product.
- Protect small containers from physical damage. Keep containers closed when not in use. Open containers slowly to allow any excess pressure to vent.
- Keep away from heat, sparks, flame or other sources of ignition. Use spark-resistant tools.
- See the National Fire Protection Agency (NFPA) #30 “Flammable and Combustible Liquids Code” and consult with qualified fire protection specialists to determine specific storage tank design requirements.
- Use proper electrical grounding and bonding procedures when loading, unloading and transferring. Refer to the National Fire Protection Agency (NFPA) #77 “Recommended Practice for Static Electricity” for proper electrical grounding procedures.
- Electrical equipment and circuits in all storage and handling areas must conform to requirements of national electrical code (Articles 500 and 501) for hazardous location.
- Blanketing may be used to retain quality in long-term storage conditions.
- For further information on safety and handling, please use the following link:  
<http://www.celanese.com/msds/>

### Packaging

The following containers are suitable for handling and transportation of Acetic Anhydride:

- DOT 111A100W1 or 111A60ALW1 Tank Cars
- DOT MC 307 or DOT 407 Tank Trucks
- UN 1H1/Y1.9/150 55-Gallon High Density Polyethylene Drums
- IMO 1 ISO Tank
- Ship Tank and Barge

Acetic Anhydride is available from Celanese Chemicals as bulk material

# Product Description and Handling Guide

## Acetic Anhydride

### *Materials of Construction for Storage and Transportation.*

Unit / element	Acceptable Material	Alternate Material
Tank	Stainless Steel <sup>1</sup>	Aluminum <sup>2</sup>
Piping	Stainless Steel <sup>1</sup>	Aluminum <sup>2</sup>
Valves	Stainless Steel <sup>1</sup>	Aluminum <sup>2</sup>
Pumps	Stainless Steel <sup>1</sup>	–
Relief Valves	Stainless Steel <sup>1</sup>	–
Gaskets	PTFE <sup>4</sup>	Butyl Rubber
Pump Seals	Single Mechanical Seal: Stainless Steel / Hastelloy C-276 metallic components, Kalrez O-rings	–
Valve Packing	PTFE <sup>4</sup>	–
Pipe End Connections	Welded and flanged system	Threaded with PTFE <sup>4</sup> tape thread lubricant
Heat Exchanger	Product side: Stainless Steel <sup>1</sup>	–
Hoses	Stainless Steel <sup>1</sup>	Butyl Rubber, Hard Natural Rubber
Tank Truck	Stainless Steel <sup>1</sup>	Aluminum <sup>2</sup>
Tank Car	Stainless Steel <sup>1</sup>	Aluminum <sup>2</sup> Lined Carbon Steel <sup>3</sup>
ISO Tank	Stainless Steel <sup>1</sup>	–
Barge	Stainless Steel <sup>1</sup>	–
Ship Tank	Stainless Steel <sup>1</sup>	–

1. Type 304 or 316 Stainless Steel
2. Use 3000, 5000, 6000 series Aluminum when temperature does not exceed 120 °F (49 °C).
3. Lining refers to high baked phenolic resin.
4. Polytetrafluoroethylene

For further information on safety and handling, please use the following link: <http://www.celanese.com/msds/>

# Product Description and Handling Guide

## Acetic Anhydride

### Guidelines

#### Chemical Inventory Status

The substance is listed in the following chemical inventories:

<i>Chemical Inventory Status</i>	<i>Listed</i>	<i>Comment</i>
AICS (Australia)	X	
DSL (Canada)	X	
NDSL (Canada)		
IECSC (China)	X	
EINECS (Europe)	X	EC-No.: 203-564-8
ELINCS (Europe)		
ENCS (Japan)	X	Japanese ECNS Number (2)-690
ISHL (Japan)	X	Japanese ISHL Number (2)-690
KECI (Korea)	X	Korean ID Number: KE-00017
NZIoC (New Zealand)	X	
PICCS (Philippines)	X	
TSCA (USA)	X	

#### § REACH

Celanese is aware of the obligations imposed by the European Union legislation REACH (“Registration, Evaluation, Authorization and Restriction of Chemicals”) on EU manufacturers and importers as well as on downstream users. We are obliged to comply with the requirements of the REACH legislation relating to our European manufacturing facilities, our own imports as well as our obligations as a downstream user in the European chemical industry. Should you require additional information, please contact Celanese at [REACH@celanese.com](mailto:REACH@celanese.com)

- **BSE/TSE Statement**

Acetic Anhydride is produced via a totally synthetic process, and no materials of animal origin are used in its manufacture. Therefore, Celanese does not expect this product to pose any risk for the transmission of Bovine Spongiform Encephalopathy (BSE) and Transmissible Spongiform Encephalopathies (TSE).

- **Genetically Modified Organisms (GMO)**

Celanese does not use any ingredients of animal or plant origin in the manufacture of Acetic Anhydride. Therefore, we can certify that the supplied Acetic Anhydride contains no genetically modified organisms (GMOs) and no GMOs were used in its production.

- **Residual Solvents**

Based on our knowledge of process technology and product characteristics, Celanese Acetic Anhydride is not expected to contain Residual Solvents above the concentration limits specified by the “Tripartite Guideline” (CPMP/ICH/283/95 and CPMP/ICH/1940/00) and by USP-467 (2007). The major impurity is Acetic Acid, which is listed as a class 3 solvent in the mentioned guidelines. Acetic Acid is present at levels below 0.5 wt. %.

# Product Description and Handling Guide

## Acetic Anhydride



- **California Proposition 65 List**

Acetic Anhydride (CAS# 108-24-7) manufactured by Celanese is not listed on the California Proposition 65 list, and based on the impurity profile of the material, does not require labeling under California Proposition 65.

- **TSCA**

Acetic Anhydride (CAS# 108-24-7) manufactured by Celanese complies with all applicable rules or orders under the Toxic Substances Control Act (TSCA).

- **Kosher**

Acetic Anhydride manufactured by Celanese is Kosher certified.

- **Allergens Guide**

Based on the knowledge of our raw materials and manufacturing process, Celanese Acetyl Intermediates does not expect any of the following allergens and/or intolerance factors to be present in Acetic Anhydride: Egg and egg products, milk and milk products, peanuts or peanut derivatives, tree nuts, fish and fish products, shellfish (crustaceans), molluscs, crabs, sesame seeds and products thereof, celery and products thereof, mustard and products thereof, wheat and wheat derivatives, soya and soy products, cereals containing gluten (i.e. wheat, rye, barley, oats, spelt, kamut or their hybridised strains) and products thereof, buckwheat, lupin, sulphur dioxide and sulphites (at > 10 mg/kg or 10 mg/liter, as SO<sub>2</sub>). No nutritional data is available for Acetic Anhydride.

- **Others**

Celanese Acetic Anhydride contains no melamine, cyanuric acid, or irradiated products, and neither of these materials is included in or produced in the manufacturing process.

Celanese Pte Ltd  
10 Anson Road, #14-01 / 02,  
International Plaza  
Singapore (079903)  
Tel: (65) 6513-0443  
Fax: (65) 6227-8397

Celanese (Shanghai) International  
Trading Co. Ltd  
4560 Jinke Road  
Zhang Jiang, Pudong New Area  
Shanghai 201203 P. R. China  
Tel: +86-21-38619288  
Fax: +86-21-38619588

Celanese Chemicals (North  
America)  
1601 West LBJ Freeway  
Dallas, TX 75234  
Tel: 1-972-443-4000

Celanese Chemicals (Europe GmbH)  
Frankfurter Straße 111  
61476 Kronberg im Taunus  
Deutschland / Germany  
Tel: +49 69 45009 0  
Fax: +49 69 45009 50000

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