GPS Safety Summary

Adipic acid

Chemical Identity

Brand names	**Rhodiacid AA - Adipic acid**	*CAS number*	**124-04-9**
Chemical name (IUPAC)	**Hexanedioic acid**	*Molecular formula*	**$C_6H_{10}O_4$**
Synonyms	**1,6-Hexanedioic acid; Hexane-1,6-dioic acid**	*Molecular weight*	**146.14 g/mol**

Applications

Adipic acid is mainly used in the production of polymers, especially as a monomer for the synthesis of nylon 6-6. It is used also in a wide range of applications, for example in coatings, plasticizers and detergents.

Safety Assessment, Exposure and Risk Management Recommendations

Physical and chemical properties

Property	Result
Physical state	Solid at room temperature
Colour	white
Odour	Slight odour
Boiling point	337.5°C at atmospheric pressure
Melting point range	150.9°C at atmospheric pressure
Flammability	Non flammable
Water solubility	Readily soluble
Octanol water partition	Not potentially bioaccumulable

Health effects

Adipic acid is a severe irritant for the eyes. For industrial uses, safety measures must be respected. For more details, consult the Safety Data Sheet.
For consumer applications, it is used in suitable concentrations according to appropriate regulations

Environmental effects

Adipic acid is readily biodegradable, not persistent and has a low potential for bioaccumulation.
Industrial and professional sites emissions, disposal, treatment or recycling must comply with applicable regulations to preserve environment.

Regulatory information and certifications

Classification and labelling

EU regulation (EC) 1272/2008 (CLP)

Warning

Eye irritation, Cat 2 H319 Causes serious eye irritation

According to Rhodia opinion the EU harmonised classification and labelling is not the current state of knowledge. Rhodia would recommend a reclassification as eye irritant Category 1: Causes serious eye damage (H318).

Registration and certification

ISO 9001: 2008 certified
EU regulation on chemicals (EC) 1907/2006 (REACH)

GPS Safety Summary

This Product Safety Summary is intended to provide a general overview of the chemical substance in the context of ICCA Global Product Strategy. The information on the Summary is basic information and is not intended to provide emergency response information, medical information or treatment information. The summary should not be used to provide in-depth safety and health information. In-depth safety and health information can be found on the (extended) Safety Data Sheet (e)SDS for the chemical substance.

Adipic acid

General Statement

Adipic acid is a white crystalline powder. This organic compound is the most important synthetic dicarboxylic acid annually produced, mainly used as a precursor for the production of nylon.
Adipic acid is also used in the chemical industry to produce other polymers, coatings, plasticizers and detergents.

Based on available studies, the pure substance causes serious eye damage. Safety conditions of use must be observed for handling in industry, to avoid workers' eye exposure.

Adipic acid is used for some specific consumer products like dish washing machine tablets. It is formulated in suitable concentrations, according to appropriate regulations, to ensure safe use of the final product in the conditions of use written on the product packaging.

Chemical Identity

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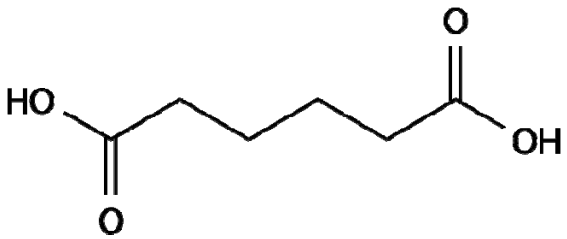
Brand names:	Rhodiacid AA - Adipic acid
Chemical name (IUPAC):	Hexanedioic acid
Synonyms:	1,6-Hexanedioic acid; Hexane-1,6-dioic acid
CAS number(s):	124-04-9
EC number:	204-673-3
Molecular formula:	$C_6H_{10}O_4$

Structure:



Uses and applications

Adipic acid is used as a monomer, mainly for the production of Nylon 6-6. It is used also as a monomer or intermediate for the synthesis of polyurethanes, mono- or polyesters for plasticizers, lubricant additives, coatings, foams or shoe soles applications.

It isalso used in formulation, for a wide number of specific applications, such as:
- tanning agent for pre-treatment of leather
- pH regulator in several processes such as the production of detergents and cleaning agents
- pelleting agent in disinfection pills for drinking water
- additive in flue gas desulphurisation
- additive in the coatings of dish washing machine tablets
- additive in laboratory chemicals.

This technical grade is not intended to be used as an additive for human or animal foodstuff.

Physical/Chemical Properties

Phys/Chem Safety Assessment

Property	Value
Physical state	Solid at 20°C and atmospheric pressure
Form	Crystalline powder
Colour	White
Odour	Slight odour
Molecular weight	146.14 g/mol
Melting Point	150.85°C at atmospheric pressure
Boiling Range	337.5°C at atmospheric pressure
Flash point	196°C
Flammability	Non flammable
Explosive properties	Non explosive
Self-ignition temperature	> 400°C at atmospheric pressure
Vapour pressure	0.097 hPa at 18.5°C
Water solubility	23 g/l at 25°C
Octanol Water partition coefficient (log Kow)	0.09 at 20°C

Based on available data, adipic acid is not classified regarding physical and chemical hazards, according to EU regulation (EC) 1272/2008.

Other hazard which do not result in classification:
Adipic acid is a combustible and divided solid which may form an explosive dust-air mixture.

Health Effects

Human Health Safety Assessment

Effect Assessment	Result
Acute Toxicity Oral/inhalation/dermal	Very low toxicity based on oral and dermal routes data, not resulting in classification No toxicity observed by inhalation
Irritation / corrosion Skin/eye/respiratory tract	May be considered as causing serious eye damage; irreversible effects observed in animal experiments Slightly irritating to the skin and irritation of the upper respiratory tract suspected, due to the acidic character of the substance but not resulting in classification
Sensitisation	No evidence of skin sensitisation
Toxicity after repeated exposure Oral/inhalation/dermal	Low toxicity after repeated oral exposure, not resulting in classification No reliable data available on repeated inhalation and dermal exposures
Genotoxicity / Mutagenicity	Neither mutagenic nor genetic effect, based on *in vitro* and *in vivo* tests results
Carcinogenicity	No carcinogenic effect based on oral route test results
Toxicity for reproduction	No adverse effect on fertility and development

Adipic acid is subject to harmonised classification and labelling in accordance with annex VI table 3.1., EU regulation (EC) 1272/2008. According to annex VI it is classified as irritating to the eyes, however, recent animal experiments showed serious eye damage. Therefore, according to Rhodia opinion the EU harmonised classification and labelling is not the current state of knowledge. Rhodia would recommend a reclassification as eye irritant Category 1: Causes serious eye damage (H318).

Environmental Effects

Environment Safety Assessment

Effect Assessment	Result
Aquatic Toxicity	Harmful to algae and invertebrates Not harmful to fish

Fate and behaviour	Result
Biodegradation	Readily and inherently biodegradable
Bioaccumulation potential	Not potentially bioaccumulative (Log Kow = 0.09)
PBT / vPvB conclusion	Not considered to be either PBT nor vPvB

Based on available data, adipic acid is considered as harmful for aquatic organisms, but as it is readily biodegradable and not potentially bioaccumulative, it is not classified as dangerous for the environment according to EU regulation (EC) 1272/2008.

Exposure

Considering the life-cycle of adipic acid, from manufacture to end-use product, human and environmental exposure have been assessed through exposure scenarios.

Human health

Adipic acid is manufactured in industry in closed processes which ensure that the risk is controlled. However, workers may be exposed during (un)loading, mixing, sampling, analysis or maintenance operations and particularly in case of batch processes during the preparation and use of adipic acid in formulations. Where there is a risk of exposure, it should be kept as minimum as possible and at a safe level (strictly below exposure limits, when applied) by the use of appropriate risk management measures as suitable collective and personal protective equipment, good industrial hygiene practices and risk communication through appropriate training of workers.

Consumers may come in contact with adipic acid when using laundry and dishwashing tablets. Adipic acid is formulated in suitable concentrations to comply with requirements of the most stringent regulations for all applicable consumer uses to ensure that final products are used safely in the conditions of use written on the packaging.

Environment

Based on its physico-chemical properties, adipic acid is water soluble and has a low potential for volatility and bioaccumulation. It is expected to partition predominantly into the aquatic compartment and not to adsorb on soil or sediment particles. Gaseous emissions in the air are not expected. Adipic acid is not persistent in the environment (readily biodegradable).

Due to these properties, an indirect exposure of humans to adipic acid via the environment is not expected.

Risk Management Recommendations

Risk management recommendations to preserve human health and environment are based on risk assessment along the substance lifecycle.

Human health

For industrial and professional uses of adipic acid and as recommended for the use of any chemical product, workers must be well informed and trained and must refer to the extended Safety Data Sheet (eSDS).

Where there is a risk of exposure to adipic acid (during (un)loading, mixing, sampling, analysis or maintenance operations and particularly in case of batch processes), it must be controlled by handling the substance under an adequate and efficient ventilation. Appropriate Personal Protective Equipment (PPE) must be worn (safety goggles, gloves, protective suit) as recommended in the eSDS. In case of exposure to dust or aerosol, a respirator with approved filter should be used. General industrial hygiene measures are required to ensure safe handling of the substance: Emergency equipment, immediately accessible; use well-maintained PPE; wash hands and skin following contact; do not eat, drink or smoke at the workplace.

For consumer uses, adipic acid is formulated in suitable concentrations according to appropriate regulations, to ensure safe-use of the final products, in the conditions of use written on the product packaging.

Environment

All industrial aqueous releases that may contain the substance are controlled in accordance with the risk assessment and must be directed to a waste water treatment plant or incinerated in compliance with local regulation.

Disposal, treatment or recycling of industrial waste must comply with applicable regulations to preserve environment.

State Agency Review

Adipic acid has been registered under:	EU regulation (EC) 1907/2006 (REACH)
Adipic acid has been reviewed under the following regulatory and/or voluntary programmes:	OECD High Production Volume Chemicals Programme, published by UNEP in 2006

Adipic acid substance meets the requirements of the most stringent regulations for all applicable consumer applications.

Regulatory Information / Classification and Labelling

Substance classification and labelling according to EU regulation (EC) 1272/2008 (CLP)*:

Classification

Eye irritation, Category 2 — H319 Causes serious eye irritation.

Labelling

Pictogram:

Signal word: Warning

Hazard statements:

H319 Causes serious eye irritation.

Precautionary statements:

P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/eye protection/face protection.
P305+351+338: IF IN EYES: rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313: If eye irritation persists: get medical advice/attention.

*Harmonised EU classification and labelling.

Contact Information within Company

For further information on this substance or Product Safety Summaries in general, please contact:

Rhodia Global Product Strategy: http://www.rhodia.com/en/sustainability/global_product_strategy/index.tcm

Contact: globalproductstrategy@eu.rhodia.com

Additional Information

ICCA Global Product Strategy: http://www.icca-chem.org/en/Home/ICCA-initiatives/global-product-strategy/

(extended) Safety Data Sheet available on demand: http://www.rhodia.com/en/contact/contact_form_business.tcm

Glossary of technical terms: http://www.rhodia.com/en/sustainability/global_product_strategy/glossary/index.tcm

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Disclaimer

The information provided in the present Safety Summary is based on European data available in REACH regulatory dossier (EC N°1907/2006) and is correct to the best of our knowledge, information and belief at the date of its publication. Such information is only intended to provide a general overview of the chemical substance in the context of ICCA Global Product Strategy and is not to be considered as a warranty or quality specification. It does not replace the safety data sheet and technical sheets. Thus, the information provided in this Safety Summary only relates to the designated specific product and may not be applicable if such product is used in combination with other materials or in another manufacturing process, unless otherwise specifically indicated. It does not release the user from ensuring he is in conformity with all regulations linked to its activity.