Established in 1981
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Safety Data Sheet

1. PRODUCT IDENTIFICATION

Name	**Adipic Acid**
Synonyms	**1,6-hexanedioic acid; 1,4-butanedicarboxylic acid; adipic acid**
CAS#	**124-04-9**
Europe EC#	**204-673-3**
Product Uses	**manufacture of nylon, polyurethane foam, coatings, adhesives, plasticizers, etc**

EMERGENCY INFORMATION

Canada	**Call CANUTEC (collect)**	**(613) 996-6666**
U.S.A.	**Call CHEMTREC**	**(800) 424-9300**

2. HAZARDS

GHS Class	***eye irritant***	***respiratory irritant***
(Category)	***(2B) – no Pictogram***	***(3)***
Signal Words	**WARNING**	**WARNING**
Hazard Statements	*causes eye irritation (H320)*	*may cause respiratory tract irritation (H335)*

Canada – WHMIS Key: **D 2B**

B 2 *– Flash Point <38°C,* ***B 3*** *– Flash Point >38°C & <93°C*
D 1 *– Immediately Toxic,* ***D 2*** *– Chronic Toxicity*
C *– Oxidising Substance,* ***E*** *– Corrosive,* ***F*** *– Reactive Substance*

3. COMPOSITION

	%	TWAEV / TLV mg/m^3	LD_{50} (mg/kg) ORAL	LD_{50} (mg/kg) SKIN	LC_{50} ppm INHALATION
1,6-hexanedioic acid	100%	5	>1900	>7940	>7700

4. FIRST AID

SKIN: Brush off. Wash with soap & water. Remove contaminated clothing. Do not reuse until thoroughly laundered.

EYES: Wash eyes with plenty of water, holding eyelids open. Seek medical assistance promptly if there is any irritation.

INHALATION: Remove from contaminated area promptly. ***CAUTION: Rescuer must not endanger himself!*** If breathing stops, administer artificial respiration and seek medical aid promptly.

INGESTION: Give plenty of water to dilute product. Do not induce vomiting (NOTE below). Keep victim quiet. If vomiting occurs, lower victim's head below hips to prevent inhalation of vomited material. Seek medical help promptly.

Inadvertent inhalation of vomited material may seriously damage the lungs. The danger of this is greater than the risk of poisoning through absorption of this relatively low-toxicity substance. The stomach should only be emptied under medical supervision, and after the installation of an airway to protect the lungs.

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5. FIRE FIGHTING & FLAMMABILITY

Flash Point	196°C / 385°F (closed cup)
Autoignition Temperature	420°C / 788°F
Flammable Limits	not known – dust ignites at concentrations above 35g/m^3
Combustion Products	carbon monoxide, nitrogen oxides, smoke, irritating fumes & cyclopentane
Firefighting Precautions	water fog or water spray are preferred; firefighters must wear SCBA
Static Charge Accumulation	dust may accumulate a static charge

6. ACCIDENTAL RELEASE MEASURES

Leak Precaution	not applicable – *solid substance*
Handling Spill	sweep, shovel & store in closed containers for recycling or disposal; a dust-supressing sweeping compound may be helpful in keeping down dust

7. HANDLING & STORAGE

Store in a cool, dry environment, away from open flame, oxidising agents and substances named in Part 10 (below).

Product dust may accumulate a static charge on transfer from one container to another. Ignition of this dust by a static discharge is possible. Ground all transfer equipment & control dust with local mechanical ventilation. Avoid generating or breathing product dust. If dust forms in use, install adequate ventilation. Keep transfer equipment clean and dust-free to minimise ignition hazard.

Never cut, drill, weld or grind on or near this container. Avoid prolonged contact with skin and wash work clothes frequently. An eye bath and safety shower should be available near the workplace.

8. EXPOSURE CONTROL & PERSONAL PROTECTION

Ontario TWAEV	5mg/m^3	Ontario STEV	not listed
ACGIH TLV	5mg/m^3	ACGIH STEL	not listed
OSHA PEL	not listed	OSHA STEL	not listed
Ventilation	mechanical ventilation may be required to control airborne titre to regulated limits		
Hands	no special protective gloves required		
Eyes	safety glasses with side shields or goggles – *always protect the eyes*		
Clothing	no special protective clothing required		

9. PHYSICAL PROPERTIES

Odour & Appearance	odourless, white crystalline solid with sour acidic taste
Odour Threshold	not known – odourless
Vapour Pressure	0.073mmHg / 0.0097kPa (18.5°C / 65°F)
Evaporation Rate (*Butyl Acetate = 1*)	nil – not volatile
Vapour Density (air = 1)	5
Boiling Range	337°C / 640°F (101kPa) ***OR*** 265°C / 509°F (100mmHg / 13.3kPa) *decomposition to valeric acid & other substances begins above 330°C / 626°F*
Melting Point	152°C / 306°F
Density	1.34 kg/litre (20°C)
Water Solubility	14 grams per litre (18°C / 64°F)
Also soluble in	very soluble in ethanol & methanol; slightly soluble in acetone & ethyl acetate
Log $P_{O/W}$ (Octanol/H_2O partition)	not known
Viscosity	4.54 centipoise (160°C / 320°F – *molten material*)
pH	2.7 (saturated solution), 3.2 (0.1% solution)
Conversion Factor	1ppm = 5.96mg/m^3
Molecular Weight	146grams per mole

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10. REACTIVITY

Dangerously Reactive With	strong oxidising agents; strong alkalies or reducing agents
Also Reactive With	slightly corrosive to many base metals; stainless steels with Cr, Mo, & Ni are resistant
Stability	stable up to 330°C/626°F; may polymerise violently in presence of alcohols, glycols, aldehydes, epoxides or polymerisable compounds
Decomposes in Presence of	heat above 330°C
Decomposition Products	apart from Hazardous Combustion Products, thermal decomposition yields cyclopentane
Sensitive to Mechanical Impact	no

11. TOXICITY

Effects, Acute Exposure

Skin Contact	dry product is expected to have no effect, solutions may be mildly irritating
Skin Absorption	probably nil; no toxic effects likely by this route
Eye Contact	dust is a mechanical irritant; some animal evidence of "chemical" irritancy
Inhalation	dust above 20mg/m^3 reported to be irritating; as is the vapour of strongly heated product
Ingestion	volunteers ingested 100mg/kg/day for 8 days without effect – *not a route of industrial exposure*

Effects, Chronic Exposure

General	prolonged exposure may cause dermatitis; inhalation of very high dust concentration proved mildly toxic to rats; ingesting diets with 3%-5% adipic acid reduced growth in rats; *not relevant to industrial exposure*
Sensitising	not a sensitiser in humans or animals; *one instance of skin sensitisation and two of respiratory sensitisation suggest that this is a very rare occurrence*
Carcinogen/Tumorigen	not considered a tumorigen or a carcinogen in humans or animals
Reproductive Effect	no known effect in humans or animals
Mutagen	no known effect on humans or animals
Synergistic With	not known
LD_{50} (oral)	3600, 5560 & 5700mg/kg (rat), 11,000mg/kg (rat & rabbit); 1900, 4175 & 4200mg/kg (mouse)
LD_{50} (skin)	>7940mg/kg (rabbit) – *no mortality*
LC_{50} (inhalation)	>7700mg/m^3 (rat) – *no mortality*

12. ECOLOGICAL INFORMATION

Bioaccumulation	readily metabolised or excreted; not a bioaccumulator
Biodegradation	biodegrades readily & rapidly in the presence of oxygen; rates from 83% in 30 days & 92% in 14 days to 90% in 5 days have been reported
Abiotic Degradation	reacts with atmospheric hydroxyl radicals; estimated ½-life in air is 3 days
Mobility in soil, water	water soluble; moves readily in soil and water
Aquatic Toxicity	
LC_{50} (Fish, 96hr)	230mg/litre (Leuciscus idus), 97mg/litre (Pimephales promelas)
EC_{50} (Crustacea, 48hr)	86mg/litre (Daphnia magna), 276mgélitre (Daphnia magna – 24hr)
EC_{50} (Algae, 72hr)	26.6 & 31.3mg/litre (Scenedesmus subspicatus)
EC_{50} (Bacteria)	91.9mg/litre (Pseudomonas putida)

13. DISPOSAL

Waste Disposal	**do not flush to sewer**, local regulations may permit disposal in sanitary landfill, may be incinerated in approved facility after mixing with a flammable waste solvent
Containers	**Drums** should be reused. Recondition and pressure test by a licensed reconditioner prior to re-use. **Pails** must be vented and thoroughly dried prior to crushing and recycling. **IBCs** (intermediate bulk containers): polyethylene bottle must be pressure tested & recertified at 30 months. Replace at 60 months (5yrs). Steel containers must be inspected, pressure tested & recertified every 5 years. ***Never cut, drill, weld or grind on or near this container, even if empty***

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14. TRANSPORT CLASSIFICATION

Canada TDG	**PIN**	**UN – not regulated for transport**
AND	**Shipping Name**	**not regulated for transport**
U.S.A. 49 CFR	**Class & Packing Group**	**not regulated for transport**
Marine Pollutant		not a marine pollutant
ERAP Required		**NO**

15. REGULATIONS

Canada DSL	**on inventory**
U.S.A. TSCA	**on inventory**
Europe EINECS	**on inventory**

U.S.A. Regulations:

Threshold Limit Values: 8 hr Time Weighted Avg (TWA): 5 mg/cu m. Excursion Limit Recommendation: Excursions in worker exposure levels may exceed 3 times the TLV-TWA for no more than a total of 30 minutes during a work day, and under no circumstances should they exceed 5 times the TLV-TWA, provided that the TLV-TWA is not exceeded.

Atmospheric Standards: This action promulgates standards of performance for equipment leaks of Volatile Organic Compounds (VOC) in the Synthetic Organic Chemical Manufacturing Industry (SOCMI). The intended effect of these standards is to require all newly constructed, modified, and reconstructed SOCMI process units to use the best demonstrated system of continuous emission reduction for equipment leaks of VOC, considering costs, non air quality health and environmental impact and energy requirements. Adipic acid is produced, as an intermediate or final product, by process units covered under this subpart.

Clean Water Act Requirements: Designated as a hazardous substance under section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978. These regulations apply to discharges of this substance.

CERCLA Reportable Quantities: Persons in charge of vessels or facilities are required to notify the National Response Center (NRC) immediately, when there is a release of this designated hazardous substance, in an amount equal to or greater than its reportable quantity of 5000 lb or 2270 kg. The toll free number of the NRC is (800) 424-8802; In the Washington D.C. metropolitan area (202) 426-2675. The rule for determining when notification is required is stated in 40 CFR 302.4 (section IV. D.3.b).

FDA Requirements: Substance added directly to human food affirmed as generally recognized as safe (GRAS). This substance is generally recognized as safe when used as a buffer and neutralizing agent in accordance with good manufacturing or feeding practice. Adipic acid is an indirect food additive in polymer used as a basic component of single and repeated use food contact surfaces. Polyurethane resins (produced when one or more of the isocyanates listed in paragraph (a)(1) of this section is made to react with one or more of the substances listed in paragraph (a)(2) of this section /in which adipic acid is included/) /are approved/ for use on dry solids with the surface containing no free fat or oil (no end test required). Adipic acid is an indirect food additive polymer for use as a basic component of single and repeated use food contact surfaces. Cross-linked polyester resins (produced by the condensation of one or more of the acids listed in paragraph (a)(1) of this section /in which adipic acid is included/ with one or more of the alcohols or epoxides listed in paragraph (a)(2) of this section, followed by copolymerization with one or more of the cross-linking agents listed in paragraph (a)(3) of this section), shall meet the following extractives limitations: net chloroform-soluble extractives not to exceed 0.1 mg/sq in of food contact surface tested when the prescribed food-simulating solvent is water or 8 or 50% alcohol; total nonvolatile extractives not to exceed 0.1 mg/sq in of food contact surface when ... solvent is heptane. In accordance with good manufacturing practice, finished articles containing the cross-linked polyester resins should be ... cleansed prior to ... first use in contact with food.

16. OTHER INFORMATION

Prepared for Megaloid Laboratories by Peter Bursztyn, (705) 734-1577
*Data from **RTECS**, **HSDB** (Haz. Substance Data Base), **Cheminfo** (CCOHS), **IUCLID** Datasheets (ESIS – European Chem. Substance Info. System), & others.*
Preparation Date: ***August 2004*** *Revision Date*: ***August 2007, August 2010, August 2013***

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