1. PRODUCT AND COMPANY IDENTIFICATION

Product name: o-Phenylenediamine
Product Number: P9029
Brand: Sigma
Supplier: Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA
Telephone: +1 800-335-5832
Fax: +1 800-335-5652
Emergency Phone # (For both supplier and manufacturer): (314) 778-6555
Preparation information: Sigma-Aldrich Corporation
Product Safety - Americas Region
1-800-521-8656

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Target Organ Effect, Toxic by inhalation, Toxic by ingestion, Harmful by skin absorption, Skin sensitizer, Irritant, Carcinogen, Mutagen

Target Organs
Badder, Liver, Kidney

GHS Classification
Acute toxicity, Inhalation (Category 4)
Acute toxicity, Dermal (Category 4)
Acute toxicity, Oral (Category 3)
Eye irritation (Category 2A)
Skin sensitization (Category 1)
Genetic toxicity (Category 2)
Specific target organ toxicity - single exposure (Category 2)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Signal word: Danger

Hazard statement(s)
H301: Toxic if swallowed.
H312 + H332: Harmful in contact with skin or if inhaled.
H317: May cause an allergic skin reaction.
H318: Causes serious eye irritation.
H341: Suspended of causing genetic defects.
H351: Suspected of causing cancer.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms: OPO
1,2-Diaminobenzene
1,2-Phenylenediamine

Formula: C6H8N2

Molecular Weight: 108.14 g/mol

CAS No.: 95-54-5

<table>
<thead>
<tr>
<th>EC-No.</th>
<th>n/ax-No.</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>202-430-6</td>
<td>612-145-00-2</td>
<td></td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Conditions of flammability
Not flammable or combustible.

SIGMA-ALDRICH
Material Safety Data Sheet
Version 4.2
Revision Date 07/11/2011
Print Date 12/26/2011
Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self-contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, nitrogen oxides (NOx)

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Wear respiratory protection. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

Recommended storage temperature: 2 - 8 °C

Moisture sensitive. Store under nitrogen. May darken on storage.

8. EXPOSURE CONTROLS/PERSOAL PROTECTION

Components with workplace control parameters

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>o-Phenyleneamin</td>
<td>95-54-5</td>
<td>TIWA</td>
<td>6.1 mg/m³</td>
<td>USA: ACGIH Threshold Limit Values (TLV)</td>
</tr>
</tbody>
</table>

Remarks
Acute and chronic effects of exposure to dyes and dyes in trade: The agent is a known or suspected carcinogen.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type F3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove’s outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Face shield and safety glasses. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

Skin and body protection
Complete suit protecting against chemicals. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance
Form: solid
Colour: white, tan

Safety data
pH: 8.7
Melting point/freezing point: 160 - 162 °C (312 - 324 °F)
Boiling point: 256 - 258 °C (493 - 496 °F)
Flash point: 136 °C (277 °F) - closed cup
Ignition temperature: no data available
Autoignition temperature: no data available
Lower explosion limit: 1.5 % (V)
Upper explosion limit: no data available
Vapour pressure: 3.27 hPa (2.45 mmHg) at 100 °C (212 °F)
Density: 1.030 g/cm³
Water solubility: soluble
Partition coefficient: n-octanol/water: log Pow: 0.15
Relative vapour density: no data available
Odour: no data available
Odour Threshold: no data available
Evaporation rate: no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents
11. TOXICOLOGICAL INFORMATION

Acute toxicity

- Oral LD50
  - LD50 Oral - rat: 510 mg/kg
- LD50 Oral - mouse: 365 mg/kg
- LD50 Oral - rat: 1,070 mg/kg

Inhalation LC50
- LC50 Inhalation - rat: 4 h - 3.4 mg/l

Dermal LD50
- Other information on acute toxicity
  - no data available

Skin corrosion/irritation
- no data available

Serious eye damage/eye irritation
- no data available

Respiratory or skin sensitization
- May cause allergic skin reaction.

The preceding data, or interpretation of data, was determined using Quantitative Structure Activity Relationship (QSAR) modeling.

Genotoxicity in vitro - rat - Liver
- Unscheduled DNA synthesis
- Genotoxicity in vitro - Human - lymphocyte
- DNA damage
- Genotoxicity in vitro - Human - Hepa cell
- DNA inhibition
- Genotoxicity in vitro - Human - lymphocyte
- Sister chromatid exchange
- Genotoxicity in vivo - mouse - Oral
- DNA inhibition
- Genotoxicity in vivo - mouse - Oral
- Micronucleus test

Carcinogenicity
- Limited evidence of carcinogenicity in animal studies

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible, or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
- no data available

Teratogenicity
- no data available

Specific target organ toxicity - single exposure (Global Harmonized System)
- May cause damage to organs.

Specific target organ toxicity - repeated exposure (Global Harmonized System)
- no data available

Aspiration hazard
- no data available

Potential health effects
- Inhalation: Toxic if inhaled. Causes respiratory tract irritation.
- Ingestion: Toxic if swallowed.
- Skin: Causes skin irritation.
- Eyes: Causes eye irritation.

Synergistic effects
- no data available

Additional Information
- RTECS: Not available

12. ECOLOGICAL INFORMATION

Toxicity
- Toxicity to daphnia and other aquatic invertebrates.

Persistence and degradability
- no data available

Bioaccumulative potential
- no data available

Mobility In soil
- no data available

PBT and vPvB assessment
- no data available

Other adverse effects
- An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
- Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

Product
- Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
- Dispose of as unused product.

14. TRANSPORT INFORMATION
DOT (US)
UN number: 1673  Class: 6.1  Packing group: III
Proper shipping name: Phenylenediamines
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 1673  Class: 6.1  Packing group: III  EMS-No: F-A, S-A
Proper shipping name: PHENYLENEDIAMINES
Marine pollutant: No

IATA
UN number: 1673  Class: 6.1  Packing group: III
Proper shipping name: Phenylenediamines

15. REGULATORY INFORMATION

OSHA Hazards
Target Organ Effect, Toxic by inhalation, Toxic by ingestion, Harmful by skin absorption, Skin sensitizer, irritant, Carcinogen, Mutagen

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>95-64-5</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>95-64-5</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

Pennsylvania Right To Know Components

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>95-64-5</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

New Jersey Right To Know Components

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>95-64-5</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

California Prop. 65 Components
WARNING! This product contains a chemical known to the State of California to cause cancer.

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>95-64-5</td>
<td>2007-09-28</td>
</tr>
</tbody>
</table>

16. OTHER INFORMATION

Further Information
Copyright 2011 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a
guide. The information in this document is based on the present state of our knowledge and is applicable to the
product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the
product. Sigma-Aldrich Co. shall not be held liable for any damage resulting from handling or from contact with the
above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.