Section 1 - Product and Company Information

Product Name: 1,4-BENZOQUINONE, 98%
Product Number: B10358
Brand: ALDRICH
Company: Sigma-Aldrich
Street Address: 3050 Spruce Street
City, State, Zip, Country: SAINT LOUIS MO 63103 US
Technical Phone: 314 771 5765
Emergency Phone: 414 273 3850 Ext. 5996
Fax: 800 325 5052

Section 2 - Composition/Information on Ingredient

Substance Name: 1,4-BENZOQUINONE
CAS #: 106-51-4
SARA: 313

Formula: C6H4O2
Synonyms: Benzo-chinon (German) * 1,4-Benzoquine *
p-Benzoquinone (OSHA) * 1,4-Benzoquinone * Chinon
(Dutch, German) * Chinone * p-Chinon (German) *
1,4-Cyclohexadienedione *
2,5-Cyclohexadiene-1,4-dione * 1,4-Cyclohexadiene
dioxide * 1,4-Diossibenzene (Italian) *
1,4-Dioxybenzene * 1,4-Dioxy-benzol (German) *
NCI-C55845 * PBQ 2 * Quinone * Quinone
(ACGIH:OSHA) * p-Quinone * RCRA waste number U197
* Steara PBQ * USAF P-220
RTECS Number: DK2625000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW
Flammable (USA) Highly Flammable (EU). Toxic. Dangerous for the
environment.
Heating may cause an explosion. Toxic by inhalation and if
swallowed. Irritating to respiratory system and skin. Risk of
serious damage to eyes. Very toxic to aquatic organisms.
Flammable solid. Target organ(s): Eyes.

HMIS RATING
HEALTH: 2*
FLAMMABILITY: 2
REACTIVITY: 1

NFPA RATING
HEALTH: 2
FLAMMABILITY: 2
REACTIVITY: 1

*additional chronic hazards present.
For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLAMMABLE HAZARDS
Flammable Hazards: Yes

EXPLOSION HAZARDS
May explode when heated.

EXPLOSION DATA
Dust Potential: This material, like most materials in powder form, is capable of creating a dust explosion.

FLASH POINT
170.6 °F   77 °C   Method: closed cup

AUTOIGNITION TEMP
435 °C

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Specific Hazard(s): Flammable solid. Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area. Shut off all sources of ignition. Use nonsparking tools.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.
METHODS FOR CLEANING UP
Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe dust. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed. Keep away from heat, sparks, and open flame. Store in a cool dry place.

SPECIAL REQUIREMENTS
Moisture sensitive.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Use only in a chemical fume hood. Use nonsparking tools. Safety shower and eye bath.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Government approved respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash contaminated clothing before reuse. Wash thoroughly after handling.

EXPOSURE LIMITS, RTECS

<table>
<thead>
<tr>
<th>Country</th>
<th>Source</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>ACGIH</td>
<td>TWA</td>
<td>0.1 PPM</td>
</tr>
<tr>
<td>USA</td>
<td>MSHA Standard-air</td>
<td>TWA</td>
<td>0.1 PPM (0.4 MG/M3)</td>
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<tr>
<td>USA</td>
<td>OSHA.</td>
<td>PEL</td>
<td>8H TWA 0.1 PPM (0.4 MG/M3)</td>
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<tr>
<td>USA</td>
<td>NIOSH</td>
<td>TWA</td>
<td>0.1 PPM</td>
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</table>

EXPOSURE LIMITS

<table>
<thead>
<tr>
<th>Country</th>
<th>Source</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poland</td>
<td>NDS</td>
<td></td>
<td>0.1 MG/M3</td>
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<tr>
<td>Poland</td>
<td>NDSCh</td>
<td></td>
<td>0.4 MG/M3</td>
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<tr>
<td>Poland</td>
<td>NDSP</td>
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</table>

Section 9 - Physical/Chemical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>At Temperature or Pressure</th>
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</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Physical State: Solid</td>
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</tr>
<tr>
<td></td>
<td>Color: Deep yellow</td>
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</tr>
<tr>
<td></td>
<td>Form: Powder</td>
<td></td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>108.1 AMU</td>
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<tr>
<td>pH</td>
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<td></td>
</tr>
<tr>
<td>BP/BP Range</td>
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</tr>
<tr>
<td>MP/MP Range</td>
<td>112.5 °C</td>
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</tr>
<tr>
<td>Freezing Point</td>
<td>N/A</td>
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</tr>
<tr>
<td>Vapor Pressure</td>
<td>0.1 mmHg</td>
<td>25 °C</td>
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<tr>
<td>Vapor Density</td>
<td>3.7 g/l</td>
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</tbody>
</table>
Saturated Vapor Conc.   N/A
Bulk Density            N/A
Odor Threshold          0.106 ppm
Volatile%               N/A
VOC Content             N/A
Water Content           N/A
Solvent Content         N/A
Evaporation Rate        N/A
Viscosity               N/A
Surface Tension         32.58 mN/m          112 °C
Partition Coefficient   Log Kow: 0.2
Decomposition Temp.     243 °C
Flash Point             170.6 °F 77 °C      Method: closed cup
Explosion Limits        N/A
Flammability            N/A
Autoignition Temp       435 °C
Refractive Index        N/A
Optical Rotation        N/A
Miscellaneous Data      4.8 MM/S BURNING RATIATA 4.1 PGII FLAMMABLE E SOLID
Solubility              Other Solvents: SOLUBLE IN ALKALIES HOT PETROLEUM ETH

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Conditions of Instability: May explode when heated. Do not heat above: 50°C
Conditions to Avoid: Sensitive to moisture.
Materials to Avoid: Reacts violently with:, Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: Causes skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: Causes eye irritation.
Inhalation: Toxic if inhaled. Material is irritating to mucous membranes and upper respiratory tract.
Ingestion: Toxic if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)
Eyes.

SIGNS AND SYMPTOMS OF EXPOSURE
Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. Damage to the eyes.

TOXICITY DATA
Oral
Rat
100 mg/kg
LD50
Oral
Rat
130 mg/kg
LD50

Intraperitoneal
Rat
30 mg/kg
LD50

Intravenous
Rat
25 mg/kg
LD50

Oral
Mouse
25 mg/kg
LD50

Intraperitoneal
Mouse
8500 UG/KG
LD50

Subcutaneous
Mouse
93800 UG/KG
LD50

Subcutaneous
Mammal
296 mg/kg
LD50

CHRONIC EXPOSURE - CARCINOGEN
Result: This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

Species: Mouse
Route of Application: Skin
Dose: 800 mg/kg
Exposure Time: 29W
Frequency: C
Result: Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Lungs, Thorax, or Respiration: Tumors. Skin and Appendages: Other: Tumors.

Species: Mouse
Route of Application: Skin
Dose: 6326 mg/kg
Exposure Time: 43W
Frequency: C
Result: Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Lungs, Thorax, or Respiration: Tumors. Skin and Appendages: Other: Tumors.

IARC CARCINOGEN LIST

Rating: Group 3

CHRONIC EXPOSURE - MUTAGEN

Species: Human
Dose: 100 UMOL/L
Cell Type: Bone marrow
Mutation test: DNA

Species: Human
Dose: 5 UMOL/L
Cell Type: lymphocyte
Mutation test: Other mutation test systems

Species: Human
Dose: 5 UMOL/L
Cell Type: lymphocyte
Mutation test: Sister chromatid exchange

Species: Mouse
Route: Oral
Dose: 20 MG/KG
Mutation test: Micronucleus test

Species: Mouse
Dose: 50 UMOL/L
Cell Type: Embryo
Mutation test: Micronucleus test

Species: Mouse
Dose: 400 UG/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Mouse
Dose: 4 UMOL/L
Cell Type: lymphocyte
Mutation test: DNA damage

Species: Mouse
Dose: 5 UMOL/L
Cell Type: lymphocyte
Mutation test: DNA inhibition

Species: Mouse
Dose: 10 UMOL/L
Cell Type: lymphocyte
Mutation test: Other mutation test systems

Species: Mouse
Dose: 6 UMOL/L
Cell Type: Other cell types
Mutation test: Other mutation test systems

Species: Mouse
Dose: 2100 NMOL/L
Cell Type: lymphocyte  
Mutation test: Mutation in mammalian somatic cells.

Species: Hamster  
Dose: 6700 UMOL/L  
Cell Type: lung  
Mutation test: Micronucleus test

Species: Rabbit  
Dose: 2 UMOL/L  
Cell Type: Bone marrow  
Mutation test: Other mutation test systems

Section 12 - Ecological Information

ACUTE ECOTOXICITY TESTS

Test Type: EC50 Algae  
Species: Selenastrum capricornutum resp.  
Time: 4 h  
Value: 0.08 mg/l

Test Type: LC50 Fish  
Time: 96 h  
Value: 0.4 mg/l

Test Type: LC50 Fish  
Species: Onchorhynchus mykiss (Rainbow trout)  
Time: 96 h  
Value: 0.04 - 0.125 mg/l

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION

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. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT

Proper Shipping Name: Benzoquinone  
UN#: 2587  
Class: 6.1  
Packing Group: Packing Group II  
Hazard Label: Toxic substances.  
PIH: Not PIH

IATA

Proper Shipping Name: Benzoquinone  
IATA UN Number: 2587  
Hazard Class: 6.1  
Packing Group: II

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION

Symbol of Danger: T N  
Indication of Danger: Toxic. Dangerous for the environment.  
R: 23/25 36/37/38 50
Risk Statements: Toxic by inhalation and if swallowed. Irritating to eyes, respiratory system and skin. Very toxic to aquatic organisms.
S: 26 28 45 61
Safety Statements: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of soap-suds. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Avoid release to the environment. Refer to special instructions/safety data sheets.

US CLASSIFICATION AND LABEL TEXT
Risk Statements: Heating may cause an explosion. Toxic by inhalation and if swallowed. Irritating to respiratory system and skin. Risk of serious damage to eyes. Very toxic to aquatic organisms.
Safety Statements: Keep away from sources of ignition - no smoking. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of soap-suds. Wear eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Avoid release to the environment. Refer to special instructions/safety data sheets.
US Statements: Flammable solid. Target organ(s): Eyes.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: Yes
DEMINIMIS: 1 %
NOTES: This product is subject to SARA section 313 reporting requirements.
TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
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 Inc., 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.
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