Material Safety Data Sheet

Hazard Alert Code Key: EXTREME HIGH MODERATE LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
2,2-Azobisisobutyric acid dimethyl ester

STATEMENT OF HAZARDOUS NATURE

NFPA

SUPPLIER
Santa Cruz Biotechnology, Inc.
2145 Delaware Avenue
Santa Cruz, California 95060
800.457.3801 or 831.457.3800

EMERGENCY
ChemWatch
Within the US & Canada: 877–715–9305
Outside the US & Canada: +800 2436 2255
(1–800-CHEMCALL) or call +613 9573 3112

SYNONYMS
C10-H18-N2-O4, "propanoic acid, 2, 2’-azobis(2-methyl-, dimethyl ester", "2, 2’-azobis(2-methylpropanoic acid, dimethyl ester", "propionic acid, 2, 2’-azobis(2-methyl-, dimethyl ester", "2, 2’-azobis(methyl isobutyrate)", "dimethyl azobisisobutyrate", "dimethyl alpha, alpha’-azobisisobutyrate", "dimethyl 2, 2’-azobisisobutyrate", "dimethyl azodisobutyrate", V-601

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammability</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Toxicity</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Body Contact</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Reactivity</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Chronic</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

CANADIAN WHMIS SYMBOLS
EMERGENCY OVERVIEW

RISK
Harmful by inhalation, in contact with skin and if swallowed.
Highly flammable.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED
Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.

EYE
Although the material is not thought to be an irritant, direct contact with the eye may cause transient discomfort characterized by tearing or conjunctival redness (as with windburn). Slight abrasive damage may also result.

SKIN
Skin contact with the material may be harmful; systemic effects may result following absorption.
The material is not thought to be a skin irritant (as classified using animal models). Abrasive damage however, may result from prolonged exposures.
Open cuts, abraded or irritated skin should not be exposed to this material.
Enter into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects.
Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED
Inhalation of vapors, aerosols (mists, fumes) or dusts, generated by the material during the course of normal handling, may be harmful.
The material is not thought to produce respiratory irritation (as classified using animal models). Nevertheless inhalation of dusts, or fume, especially for prolonged periods, may produce respiratory discomfort and occasionally, distress.
Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.

CHRONIC HEALTH EFFECTS
Long-term exposure to the product is not thought to produce chronic effects adverse to the health (as classified using animal models); nevertheless exposure by all routes should be minimized as a matter of course.
Long term exposure to high dust concentrations may cause changes in lung function i.e. pneumoconiosis; caused by particles less than 0.5 micron penetrating and remaining in the lung.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>NAME</th>
<th>CAS RN</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>dimethyl 2,2'-azodiisobutyrate</td>
<td>2589-57-3</td>
<td>&gt;98</td>
</tr>
</tbody>
</table>

Section 4 - FIRST AID MEASURES

SWALLOWED
· IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY. · Where Medical attention is not immediately available or where the patient is more than 15 minutes from a hospital or unless instructed otherwise:

EYE
If this product comes in contact with the eyes: · Wash out immediately with fresh running water. · Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.

SKIN
If skin contact occurs: · Immediately remove all contaminated clothing, including footwear · Flush skin and hair with running water (and soap if available).

INHALED
· If fumes or combustion products are inhaled remove from contaminated area. · Lay patient down. Keep warm and rested.

NOTES TO PHYSICIAN
· For poisons (where specific treatment regime is absent):

--- BASIC TREATMENT ---
· Establish a patent airway with suction where necessary.
· Watch for signs of respiratory insufficiency and assist ventilation as necessary.
Treat symptomatically.
Section 5 - FIRE FIGHTING MEASURES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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<tbody>
<tr>
<td>Vapour Pressure (mmHG)</td>
<td>Negligible</td>
</tr>
<tr>
<td>Upper Explosive Limit (%)</td>
<td>Not available</td>
</tr>
<tr>
<td>Specific Gravity (water=1)</td>
<td>1.013</td>
</tr>
<tr>
<td>Lower Explosive Limit (%)</td>
<td>Not available</td>
</tr>
</tbody>
</table>

**EXTINGUISHING MEDIA**
- **For SMALL FIRES:**
  - Dry chemical, CO2, water spray or foam.
- **For LARGE FIRES:**
  - Flood fire area with water from a distance.

**FIRE FIGHTING**
- **BEWARE OF POSSIBLE CONTAINER EXPLOSION**
  - Alert Emergency Responders and tell them location and nature of hazard.
- **May be violently or explosively reactive.**
- When any large container (including road and rail tankers) is involved in a fire, consider evacuation by 1000 metres in all directions.

**GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS**
- Combustion products include:
  - Self-decomposition or self-ignition may be initiated by heat, chemical reaction, friction or impact.
  - The material is particularly sensitive to temperature rises; above a given CONTROL TEMPERATURE, it may decompose violently and catch fire, carbon dioxide (CO2), nitrogen oxides (NOx), other pyrolysis products typical of burning organic material.

**FIRE INCOMPATIBILITY**
- Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

**PERSONAL PROTECTION**
- Glasses: Chemical goggles.
- Gloves:
- Respirator: Particulate

Section 6 - ACCIDENTAL RELEASE MEASURES

**MINOR SPILLS**
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames).
- Do NOT touch or walk through spilled material.

**MAJOR SPILLS**
- Clear area of personnel and move upwind.
- Alert Emergency Responders and tell them location and nature of hazard.

Section 7 - HANDLING AND STORAGE

**PROCEDURE FOR HANDLING**
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of overexposure occurs.
- Empty containers may contain residual dust which has the potential to accumulate following settling. Such dusts may explode in the presence of an appropriate ignition source.
- Do NOT cut, drill, grind or weld such containers.
- In addition ensure such activity is not performed near full, partially empty or empty containers without appropriate workplace safety authorisation or permit.

**RECOMMENDED STORAGE METHODS**
- For low viscosity materials and solids: Drums and jerricans must be of the non-removable head type. Where a can is to be used as an inner package, the can must have a screwed enclosure.

**STORAGE REQUIREMENTS**
- FOR MINOR QUANTITIES:
  - Store in an indoor fireproof cabinet or in a room of noncombustible construction
  - Provide adequate portable fire-extinguishers in or near the storage area.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

**EXPOSURE CONTROLS**

<table>
<thead>
<tr>
<th>Source</th>
<th>Material</th>
<th>TWA ppm</th>
<th>TWA mg/m³</th>
<th>STEL ppm</th>
<th>STEL mg/m³</th>
<th>Peak ppm</th>
<th>Peak mg/m³</th>
<th>TWA F/CC</th>
<th>Notes</th>
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<tr>
<td>Location</td>
<td>Substance</td>
<td>Exposure Type</td>
<td>Limit</td>
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<tr>
<td><strong>US - Oregon</strong></td>
<td>dimethyl 2,2'-azodiisobutyrate</td>
<td>Inert or Nuisance Dust: (d) Total dust</td>
<td>10</td>
<td></td>
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<tr>
<td>Permissible Exposure Limits (Z-3)</td>
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<tr>
<td><strong>US OSHA</strong></td>
<td>dimethyl 2,2'-azodiisobutyrate</td>
<td>Inert or Nuisance Dust: (d) Respirable fraction</td>
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<td>Permissible Exposure Levels (PELs) - Table Z3</td>
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<tr>
<td><strong>US OSHA</strong></td>
<td>dimethyl 2,2'-azodiisobutyrate</td>
<td>Inert or Nuisance Dust: (d) Total dust</td>
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<td>Permissible Exposure Levels (PELs) - Table Z3</td>
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<tr>
<td><strong>US - Hawaii Air Contaminant Limits</strong></td>
<td>dimethyl 2,2'-azodiisobutyrate</td>
<td>(Particulates not otherwise regulated - Total dust)</td>
<td>10</td>
<td></td>
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<tr>
<td><strong>US - Oregon</strong></td>
<td>dimethyl 2,2'-azodiisobutyrate</td>
<td>(Particulates not otherwise regulated - Respirable fraction)</td>
<td>5</td>
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<tr>
<td><strong>Canada - British Columbia</strong></td>
<td>dimethyl 2,2'-azodiisobutyrate</td>
<td>(Particles (Insoluble or Poorly Soluble) Not Otherwise Classified (PNOC))</td>
<td>10 (N)</td>
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<td>Occupational Exposure Limits</td>
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<td><strong>US - Wyoming</strong></td>
<td>dimethyl 2,2'-azodiisobutyrate</td>
<td>(Particulates not otherwise regulated (PNOR)(f)- Respirable fraction)</td>
<td>5</td>
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<td>Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants</td>
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<td><strong>US - Tennessee</strong></td>
<td>dimethyl 2,2'-azodiisobutyrate</td>
<td>(Particulates not otherwise regulated Respirable fraction)</td>
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<td>Occupational Exposure Limits - Limits For Air Contaminants</td>
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<tr>
<td><strong>US - California</strong></td>
<td>dimethyl 2,2'-azodiisobutyrate</td>
<td>(Particulates not otherwise regulated Respirable fraction)</td>
<td>5</td>
<td></td>
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<tr>
<td>Permissible Exposure Limits for Chemical Contaminants</td>
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<tr>
<td><strong>US - Oregon</strong></td>
<td>dimethyl 2,2'-azodiisobutyrate</td>
<td>(Particulates not otherwise regulated (PNOR) (f) Total Dust)</td>
<td>10</td>
<td></td>
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<td></td>
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<tr>
<td>Permissible Exposure Limits (Z-1)</td>
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</tr>
</tbody>
</table>

Bold print identifies substances for which the Oregon Permissible Exposure Limits (PELs) are different than the federal limits.
US - Michigan
Exposure Limits for Air
Contaminants
dimethyl 2,2'-azodiisobutyrate
(Particulates not otherwise regulated, Respirable dust)
5

Canada - Prince Edward Island
Occupational Exposure Limits
dimethyl 2,2'-azodiisobutyrate
(Particles (Insoluble or Poorly Soluble) [NOS] Inhalable particles)
10

See Appendix B current TLV/BEI Book

Bold print identifies substances for which the Oregon Permissible Exposure Limits (PELs) are different than the federal limits. PNOR means “particles not otherwise regulated.”

ENDOELTABLE

PERSONAL PROTECTION

RESPIRATOR
Particulate
Consult your EHS staff for recommendations

EYE
· Safety glasses with side shields
· Chemical goggles.

HANDS/FEET
Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:
· frequency and duration of contact,
· chemical resistance of glove material,
· glove thickness and
dexterity
Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).
· When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.
· When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.
· Contaminated gloves should be replaced.
Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.
Wear physical protective gloves, eg. leather.

OTHER
· Overalls.
· Eyewash unit.
Some plastic personal protective equipment (PPE) (e.g. gloves, aprons, overshoes) are not recommended as they may produce static electricity.
· For large scale or continuous use wear tight-weave non-static clothing (no metallic fasteners, cuffs or pockets), non sparking safety
ENGINEERING CONTROLS

- For large scale or continuous use:
  - Spark-free, earthed ventilation system, venting directly to the outside and separate from usual ventilation systems
  - Provide dust collectors with explosion vents.
  - Local exhaust ventilation is required where solids are handled as powders or crystals; even when particulates are relatively large, a certain proportion will be powdered by mutual friction.
  - Exhaust ventilation should be designed to prevent accumulation and recirculation of particulates in the workplace.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Solid.
Does not mix with water.
Sinks in water.

<table>
<thead>
<tr>
<th>State</th>
<th>Divided solid</th>
<th>Molecular Weight</th>
<th>230.26</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melting Range (°F)</td>
<td>91.4</td>
<td>Viscosity</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Boiling Range (°F)</td>
<td>Not available</td>
<td>Solubility in water (g/L)</td>
<td>Partly miscible</td>
</tr>
<tr>
<td>Flash Point (°F)</td>
<td>Not available</td>
<td>pH (1% solution)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Decomposition Temp (°F)</td>
<td>71.6-82.4</td>
<td>pH (as supplied)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Autoignition Temp (°F)</td>
<td>Not available</td>
<td>Vapour Pressure (mmHG)</td>
<td>Negligible</td>
</tr>
<tr>
<td>Upper Explosive Limit (%)</td>
<td>Not available</td>
<td>Specific Gravity (water=1)</td>
<td>1.013</td>
</tr>
<tr>
<td>Lower Explosive Limit (%)</td>
<td>Not available</td>
<td>Relative Vapor Density (air=1)</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Volatile Component (%vol)</td>
<td>Negligible</td>
<td>Evaporation Rate</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

APPEARANCE

Crystal; does not mix well with water.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of incompatible materials.
- Product is considered stable.

STORAGE INCOMPATIBILITY

- Avoid reaction with oxidizing agents.
For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

dimethyl 2,2'-azodiisobutyrate

TOXICITY AND IRRITATION

DIMETHYL 2,2'-AZODIISOBUTYRATE:

- No significant acute toxicological data identified in literature search.

Section 12 - ECOLOGICAL INFORMATION

This material and its container must be disposed of as hazardous waste.

Section 13 - DISPOSAL CONSIDERATIONS

US EPA Waste Number & Descriptions
A. General Product Information
Ignitability characteristic: use EPA hazardous waste number D001 (waste code I)

Disposal Instructions
All waste must be handled in accordance with local, state and federal regulations.
- Puncture containers to prevent re-use and bury at an authorized landfill.
Legislation addressing waste disposal requirements may differ by country, state and/or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.
A Hierarchy of Controls seems to be common - the user should investigate:
- Reduction
- Reuse
This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.

DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

- Recycle wherever possible.
- Consult manufacturer for recycling options or consult Waste Management Authority for disposal if no suitable treatment or disposal facility can be identified.

Section 14 - TRANSPORTATION INFORMATION

DOT:
Symbols: G Hazard class or Division: 4.1
Identification Numbers: UN3236 PG: II
Label Codes: 4.1 Special provisions: None
Packaging: Exceptions: None Packaging: Non- bulk: 224
Packaging: Exceptions: None Quantity limitations: Forbidden
Passenger aircraft/rail:
Quantity Limitations: Cargo Forbidden Vessel stowage: Location: D
aircraft only:
Vessel stowage: Other: 2, 52, 53
Hazardous materials descriptions and proper shipping names:
Self-reactive solid type D, temperature controlled

Air Transport IATA:
ICAO/IATA Class: 4.1 ICAO/IATA Subrisk: None
UN/ID Number: 3236 Packing Group: - Special provisions: None
Cargo Only
Packaging Instructions: Forbidden Maximum Qty/Pack: Forbidden
Passenger and Cargo Passenger and Cargo
Packaging Instructions: Forbidden Maximum Qty/Pack: Forbidden
Passenger and Cargo Limited Quantity Passenger and Cargo Limited Quantity
Packaging Instructions: Forbidden Maximum Qty/Pack: Forbidden
Shipping Name: SELF-REACTIVE SOLID TYPE D, TEMPERATURE CONTROLLED *(CONTAINS DIMETHYL 2,2'-AZODIISOBUTYRATE)

Maritime Transport IMDG:
IMDG Class: 4.1 IMDG Subrisk: None
UN Number: 3236 Packing Group: None
EMS Number: F-F , S-K Special provisions: 194 274 923
Limited Quantities: 0
Shipping Name: SELF-REACTIVE SOLID TYPE D, TEMPERATURE CONTROLLED

Section 15 - REGULATORY INFORMATION
dimethyl 2,2'-azodiisobutyrate (CAS: 2589-57-3) is found on the following regulatory lists;
"US - Hawaii Air Contaminant Limits","US - Oregon Permissible Exposure Limits (Z-3)","US OSHA Permissible Exposure Levels (PELs) - Table Z3"

Section 16 - OTHER INFORMATION

Reasonable care has been taken in the preparation of this information, but the author makes no warranty of merchantability or any other warranty, expressed or implied, with respect to this information. The author makes no representations and assumes no liability for any direct, incidental or consequential damages resulting from its use. For additional technical information please call our toxicology department on +800 CHEMCALL.

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references. A list of reference resources used to assist the committee may be found at: www.chemwatch.net/references.

The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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