SAFETY DATA SHEET

Isopentanoic acid
11560
Revision Date 27-May-2015
Version / Revision 2.00***
Supersedes Version 1.02***
Issuing date 01-Jun-2015

1: Identification

1.1. Product identifier
Identification of the substance/preparation Isopentanoic acid

1.2. Relevant identified uses of the substance or mixture and uses advised against
Use of the Substance / Preparation Intermediate

1.3. Details of the supplier of the safety data sheet
Supplier OXEA Corporation
1505 West LBJ Freeway, Suite 400
Dallas, TX 75234
USA
Phone: +1 972 481 2700

Product Information
Product Stewardship
FAX: +49 (0)208 693 2053
email: psq@oxea-chemicals.com

1.4. Emergency telephone number
Emergency telephone number in USA, call 800 424 9300
outside USA, call USA 703 527 3887, collect calls accepted
available 24/7***

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture
This mixture is classified in accordance with paragraph (d) of §1910.1200 (GHS-US classification).***

   Acute oral toxicity  Category 4, H302***
   Acute dermal toxicity  Category 4, H312***
   Skin corrosion/irritation  Category 1B, H314***
   Serious eye damage/eye irritation  Category 1, H318***
   Environmental hazard  Aquatic Chronic 3; H412***

OSHA Specified Hazards Not applicable.

2.2. Label elements
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Labeling according to §1910.1200 (GHS-US labeling).***

Hazard symbol(s)

Signal word
Danger***

Hazard statements
H302 + H312: Harmful if swallowed or in contact with skin
H314: Causes severe skin burns and eye damage.
H412: Harmful to aquatic life with long lasting effects.***

Precautionary statements

Prevention
P280: Wear protective gloves/protective clothing/eye protection/face protection.
P260: Do not breathe gas/mist/vapours.
P270: Do not eat, drink or smoke when using this product.
P264: Wash hands thoroughly after handling.
P273: Avoid release to the environment.***

Response
P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P302 + P352: IF ON SKIN: Wash with plenty of soap and water.
P361: Take off immediately all contaminated clothing and wash it before reuse.
P301 + P330 + P331: IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P304 + P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P310: Immediately call a POISON CENTER/doctor.***

Storage
P405: Store locked up.***

Disposal
P501: Dispose of contents/container in accordance with local regulation.***

contains
n-Valeric acid (CAS 109-52-4), 2-Methylbutyric acid (CAS 116-53-0)

2.3. Other hazards

Components of the product may be absorbed into the body by inhalation and ingestion
Vapour/air-mixtures are explosive at intense warming***

SECTION 3: Composition/information on ingredients

3.2. Mixtures

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Concentration (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-Valeric acid</td>
<td>CAS 109-52-4</td>
<td></td>
</tr>
<tr>
<td>2-Methylbutyric acid</td>
<td>CAS 116-53-0</td>
<td></td>
</tr>
</tbody>
</table>

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Valeric acid 109-52-4 < 70***
2-Methylbutyric acid 116-53-0 20 - 40***
Isovaleric acid 503-74-2 < 1***

SECTION 4: First aid measures

4.1. Description of first aid measures

Inhalation
Keep at rest. Aerate with fresh air. When symptoms persist or in all cases of doubt seek medical advice.

Eyes
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Remove contact lenses. Immediate medical attention is required.

Skin
Wash off immediately with soap and plenty of water. When symptoms persist or in all cases of doubt seek medical advice.

Ingestion
Call a physician immediately. Do not induce vomiting without medical advice.

4.2. Most important symptoms and effects, both acute and delayed

Main symptoms
central nervous system depression, unconsciousness, shortness of breath, vomiting, cough, dizziness, nausea, gastrointestinal discomfort.

Special hazard
Lung irritation, Lung oedema, Dermatitis.

4.3. Indication of any immediate medical attention and special treatment needed

General advice
Remove contaminated, soaked clothing immediately and dispose of safely. First aider needs to protect himself.

Treat symptomatically. If ingested, flush stomach and compensate acidosis.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media
foam, dry chemical, carbon dioxide (CO2), water spray

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture
Under conditions giving incomplete combustion, hazardous gases produced may consist of:
- carbon monoxide (CO)
- carbon dioxide (CO2)

Combustion gases of organic materials must in principle be graded as inhalation poisons.
Vapours are heavier than air and may spread along floors.
Vapour/air-mixtures are explosive at intense warming.

5.3. Advice for firefighters

Special protective equipment for firefighters
Fire fighter protection should include a self-contained breathing apparatus (NIOSH-approved or EN 133) and full fire-fighting turn out gear.

Precautions for firefighting
Cool containers / tanks with water spray. Keep people away from and upwind of fire. Dike and collect water used to fight fire. Water run-off and vapor cloud may be corrosive. Water run-off can cause environmental damage.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Avoid contact with skin and eyes. Avoid breathing vapors or mists. Keep people away from and upwind of spill/leak.
Ensure adequate ventilation, especially in confined areas. Keep away from heat and sources of ignition.
For emergency responders: Personal protection see section 8.

6.2. Environmental precautions
Prevent further leakage or spillage. Do not discharge product into the aquatic environment without pretreatment (biological treatment plant). Water runoff can cause environmental damage.

6.3. Methods and material for containment and cleaning up

Methods for containment
Stop the flow of material, if possible without risk. Dike spilled material, where this is possible.

Methods for cleaning up
Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. If liquid has been spilt in large quantities clean up promptly by scoop or vacuum. Dispose of in accordance with local regulations. Take necessary action to avoid static electricity discharge (which might cause ignition of organic vapours).

6.4. Reference to other sections
For personal protective equipment see section 8.

SECTION 7: Handling and storage

7.1. Precautions for safe handling
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Advice on safe handling
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product. Provide sufficient air exchange and/or exhaust in work rooms.

Hygiene measures
When using, do not eat, drink or smoke. Take off all contaminated clothing immediately. Wash hands before breaks and immediately after handling the product.

Advice on the protection of the environment
See Section 8: Environmental exposure controls.

Incompatible products
bases
amines
strong oxidizing agents

7.2. Conditions for safe storage, including any incompatibilities

Advice on protection against fire and explosion
Keep away from sources of ignition - No smoking. Take necessary action to avoid static electricity discharge (which might cause ignition of organic vapours). In case of fire, emergency cooling with water spray should be available. Ground and bond containers when transferring material. Vapour/air-mixtures are explosive at intense warming.

Technical measures/Storage conditions
Keep containers tightly closed in a cool, well-ventilated place. Handle and open container with care.

Suitable material
stainless steel

Unsuitable material
copper, nickel

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Exposure limits United States of America
No exposure limits established regarding ACGIH, OSHA Z-1 and OSHA Z-2.***

8.2. Exposure controls

Appropriate Engineering controls
General or dilution ventilation is frequently insufficient as the sole means of controlling employee exposure. Local ventilation is usually preferred. Explosion-proof equipment (for example fans, switches, and grounded ducts) should be used in mechanical ventilation systems.

Individual protection measures, such as personal protective equipment
General industrial hygiene practice
Avoid contact with skin, eyes and clothing. Do not breathe vapours or spray mist. Ensure that eyewash stations and safety showers are close to the workstation location.

Hygiene measures
When using, do not eat, drink or smoke. Take off all contaminated clothing immediately. Wash hands before breaks and immediately after handling the product.

Eye protection
Tightly fitting safety goggles. In addition to goggles, wear a face shield if there is a reasonable chance for splash to the face.

Hand protection
Wear protective gloves. Recommendations are listed below. Other protective material may be used, depending on the situation, if adequate degradation and permeation data is available. If other chemicals are used in conjunction with this chemical, material selection should be based on protection for all chemicals present.

| Suitable material       | nitrile rubber                  |
| Evaluation              | according to EN 374: level 6    |
| Glove thickness         | approx 0,55 mm                  |
| Break through time      | > 480 min                      |

| Suitable material       | polyvinylchloride              |
| Evaluation              | Information derived from practical experience |
| Glove thickness         | approx 0,8 mm                  |

Skin and body protection
Impervious clothing. Wear face-shield and protective suit for abnormal processing problems.

Respiratory protection
Respirator with filter for organic vapour. Use the indicated respiratory protection if the occupational exposure limit is exceeded and/or in case of product release (dust). Equipment should conform to NIOSH.

Environmental exposure controls
If possible use in closed systems. If leakage can not be prevented, the substance needs to be suck off at the emersion point, if possible without danger. If recycling is not practicable, dispose of in compliance with local regulations. Inform the responsible authorities in case of leakage into the atmosphere, or of entry into waterways, soil or drains.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>liquid</td>
</tr>
<tr>
<td>Colour</td>
<td>colourless</td>
</tr>
<tr>
<td>Odour</td>
<td>unpleasant</td>
</tr>
<tr>
<td>Odour threshold</td>
<td>No data available</td>
</tr>
<tr>
<td>pH</td>
<td>2,7 (37,5 g/l in water @ 20 °C (68 °F))</td>
</tr>
<tr>
<td>Melting point/range</td>
<td>&lt;-29 °F (&lt; -34 °C) (Pour point)</td>
</tr>
<tr>
<td>Boiling point/range</td>
<td>350 - 367 °F (177 - 186 °C) @ 1 atm (101,3 kPa)</td>
</tr>
<tr>
<td>Flash point</td>
<td>171 - 183 °F (77 - 84 °C)</td>
</tr>
</tbody>
</table>

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Method
ASTM D-7094

Evaporation rate
No data available

Flammability (solid, gas)
Does not apply, the substance is a liquid

Lower explosion limit
1,6 Vol %

Upper explosion limit
7,3 Vol %

Vapour pressure

<table>
<thead>
<tr>
<th>Values</th>
<th>Values</th>
<th>Values</th>
<th>@ °C</th>
<th>@ °F</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>~ 2</td>
<td>~ 0,2</td>
<td>~ 0,002</td>
<td>20</td>
<td>68</td>
<td></td>
</tr>
<tr>
<td>~ 9</td>
<td>~ 0,9</td>
<td>~ 0,009</td>
<td>50</td>
<td>122</td>
<td></td>
</tr>
</tbody>
</table>

Vapour density
~ 3,5 (Air = 1) @ 20 °C (68 °F)

Relative density

<table>
<thead>
<tr>
<th>Values</th>
<th>@ °C</th>
<th>@ °F</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,94</td>
<td>20</td>
<td>68</td>
<td>DIN 51757</td>
</tr>
</tbody>
</table>

Solubility
No data available

Water solubility
37,5 g/l @ 68 °F (20 °C) OECD 105

log Pow
1,8 (calculated)

Autoignition temperature
770 - 815 °F (410 - 435 °C)

Method
DIN 51794

Decomposition temperature
No data available

Viscosity
2,1 - 2,2 mPa*s @ 68 °F (20 °C)

Method
DIN 51562, dynamic

9.2. Other information

Molecular weight
102,13

Molecular formula
C5 H10 O2

Oxidizing properties
Does not apply, substance is not oxidising. There are no chemical groups associated with oxidizing properties

Refractive Index
1,405 - 1,408 @ 68 °F (20 °C)

Explosive properties
Does not apply, substance is not explosive. There are no chemical groups associated with explosive properties

Surface tension
51 - 64 mN/m (1 g/l @ 20°C)

SECTION 10: Stability and reactivity

10.1. Reactivity

The reactivity of the product corresponds to the typical reactivity shown by the substance group as described in any text book on organic chemistry.

10.2. Chemical stability

Stable under recommended storage conditions.

10.3. Possibility of hazardous reactions

Hazardous polymerisation does not occur.***
10.4. Conditions to avoid
Avoid contact with heat, sparks, open flame and static discharge. Avoid any source of ignition.

10.5. Incompatible materials
bases, amines, strong oxidizing agents.

10.6. Hazardous decomposition products
No decomposition if stored and applied as directed.

**SECTION 11: Toxicological information**

11.1. Information on toxicological effects

**Likely routes of exposure**
Ingestion, Inhalation, Eye contact, Skin contact***

**Valeric acid, CAS: 109-52-4**

**Main symptoms**
central nervous system depression, unconsciousness, shortness of breath, vomiting.

**Target Organ Systemic Toxicant - Single exposure**
Based on available data, the classification criteria are not met for:
STOT SE***

**Target Organ Systemic Toxicant - Repeated exposure**
Based on available data, the classification criteria are not met for:
STOT RE***

**2-Methylbutyric acid, CAS: 116-53-0**

**Main symptoms**
cough, dizziness, nausea, shortness of breath, unconsciousness, gastrointestinal discomfort.

**Target Organ Systemic Toxicant - Single exposure**
no data available***

**Target Organ Systemic Toxicant - Repeated exposure**
no data available***

**Isovaleric acid, CAS: 503-74-2**

**Main symptoms**
cough, dizziness, nausea, shortness of breath, unconsciousness, gastrointestinal discomfort.

**Target Organ Systemic Toxicant - Single exposure**
Based on available data, the classification criteria are not met for:
STOT SE***

**Target Organ Systemic Toxicant - Repeated exposure**
Based on available data, the classification criteria are not met for:
STOT RE***

**Acute toxicity**

**Valeric acid (109-52-4)**

<table>
<thead>
<tr>
<th>Routes of Exposure</th>
<th>Endpoint</th>
<th>Values</th>
<th>Species</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral</td>
<td>LD50</td>
<td>4600 mg/kg</td>
<td>rat, male/female</td>
<td>OECD 401</td>
</tr>
<tr>
<td>Dermal</td>
<td>LD50</td>
<td>&gt; 2000 mg/kg (24 h)</td>
<td>rat, male/female</td>
<td>OECD 402</td>
</tr>
</tbody>
</table>

**Emergency telephone number**
in USA, call 800 424 9300; outside USA, call USA 703 527 3887, collect calls accepted
USA (A-US)
### 2-Methylbutyric acid (116-53-0)

<table>
<thead>
<tr>
<th>Routes of Exposure</th>
<th>Endpoint</th>
<th>Values</th>
<th>Species</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral</td>
<td>LD50</td>
<td>1750 mg/kg</td>
<td>rat, male/female</td>
<td>OECD 401</td>
</tr>
<tr>
<td>Dermal</td>
<td>LD50</td>
<td>2228 mg/kg</td>
<td>rabbit male</td>
<td>OECD 402</td>
</tr>
<tr>
<td>Dermal</td>
<td>LD50</td>
<td>1367 mg/kg</td>
<td>rabbit female</td>
<td>OECD 402</td>
</tr>
<tr>
<td>Inhalative</td>
<td>LC0</td>
<td>8375 mg/m³ (6 h)</td>
<td>rat, male/female</td>
<td>OECD 403</td>
</tr>
</tbody>
</table>

### Isovaleric acid (503-74-2)

<table>
<thead>
<tr>
<th>Routes of Exposure</th>
<th>Endpoint</th>
<th>Values</th>
<th>Species</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral</td>
<td>LD50</td>
<td>~ 2500 mg/kg</td>
<td>rat male female</td>
<td>OECD 401</td>
</tr>
<tr>
<td>Dermal</td>
<td>LD50</td>
<td>&gt; 2000 mg/kg</td>
<td>rabbit male female</td>
<td>OECD 402</td>
</tr>
<tr>
<td>Inhalative</td>
<td>LC0</td>
<td>2060 mg/m³ (7 h)</td>
<td>rat</td>
<td>OECD 403</td>
</tr>
</tbody>
</table>

### Valeric acid, CAS: 109-52-4

**Assessment**

Based on available data, the classification criteria are not met for:
- Acute oral toxicity
- Acute dermal toxicity
- STOT SE

An LC50/inhalation/4h/rat could not be determined because no mortality of rats was observed at the maximum achievable concentration***

### 2-Methylbutyric acid, CAS: 116-53-0

**Assessment**

The available data lead to the classification given in section 2***

### Isovaleric acid, CAS: 503-74-2

**Assessment**

Based on available data, the classification criteria are not met for:
- Acute oral toxicity
- Acute dermal toxicity
- Acute inhalation toxicity***

### Irritation and corrosion

#### Valeric acid (109-52-4)

<table>
<thead>
<tr>
<th>Target Organ Effects</th>
<th>Species</th>
<th>Result</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin</td>
<td>rabbit</td>
<td>corrosive</td>
<td>3 min</td>
</tr>
<tr>
<td>Eyes</td>
<td>rabbit</td>
<td>corrosive</td>
<td></td>
</tr>
</tbody>
</table>

#### 2-Methylbutyric acid (116-53-0)

<table>
<thead>
<tr>
<th>Target Organ Effects</th>
<th>Species</th>
<th>Result</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin</td>
<td>rabbit</td>
<td>corrosive</td>
<td>OECD 404</td>
</tr>
</tbody>
</table>

#### Isovaleric acid (503-74-2)

<table>
<thead>
<tr>
<th>Target Organ Effects</th>
<th>Species</th>
<th>Result</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin</td>
<td>rabbit</td>
<td>corrosive</td>
<td>OECD 404</td>
</tr>
</tbody>
</table>

### Valeric acid, CAS: 109-52-4

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Assessment
The available data lead to the classification given in section 2
For respiratory irritation, no data are available***

2-Methylbutyric acid, CAS: 116-53-0
Assessment
The available data lead to the classification given in section 2
Available skin corrosion data suffice for classification of eye corrosion without further testing
For respiratory irritation, no data are available***

Isovaleric acid, CAS: 503-74-2
Assessment
The available data lead to the classification given in section 2***

Sensitization
Valeric acid (109-52-4)
Isovaleric acid (503-74-2)

<table>
<thead>
<tr>
<th>Target Organ Effects</th>
<th>Species</th>
<th>Evaluation</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin</td>
<td>Human experience</td>
<td>not sensitizing</td>
<td>OECD 406 1 %, in Petrolatum</td>
</tr>
</tbody>
</table>

Valeric acid, CAS: 109-52-4
Assessment
Skin sensitization was not tested due to the corrosive properties of the substance
For respiratory sensitization, no data are available***

2-Methylbutyric acid, CAS: 116-53-0
Assessment
Skin sensitization was not tested due to the corrosive properties of the substance
For respiratory sensitization, no data are available
For skin sensitization, no data are available***

Isovaleric acid, CAS: 503-74-2
Assessment
Based on available data, the classification criteria are not met for:
Skin sensitization
For respiratory sensitization, no data are available***

Subacute, subchronic and prolonged toxicity

2-Methylbutyric acid (116-53-0)

<table>
<thead>
<tr>
<th>Type</th>
<th>Dose</th>
<th>Species</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subchronic toxicity</td>
<td>NOAEL: 5000 mg/kg/d (90d)</td>
<td>rat, male</td>
<td>Oral read across</td>
</tr>
</tbody>
</table>

Isovaleric acid (503-74-2)

<table>
<thead>
<tr>
<th>Type</th>
<th>Dose</th>
<th>Species</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subchronic toxicity</td>
<td>NOAEL: 5000 mg/kg/d (90d)</td>
<td>rat, male</td>
<td>Oral read across</td>
</tr>
<tr>
<td>Subchronic toxicity</td>
<td>NOAEL: 1068 mg/kg/d (90d)</td>
<td>rat, male</td>
<td>OECD 408 Oral read across</td>
</tr>
<tr>
<td>Subchronic toxicity</td>
<td>NOAEL: 1431 mg/kg/d (90d)</td>
<td>rat, female</td>
<td>OECD 408 Oral read across</td>
</tr>
</tbody>
</table>

Valeric acid, CAS: 109-52-4

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USA (A-US)
10 / 17
Assessment
Due to lack of data, a classification is not possible for:
STOT RE***

2-Methylbutyric acid, CAS: 116-53-0
Assessment
Based on available data, the classification criteria are not met for:
STOT RE***

Isovaleric acid, CAS: 503-74-2
Assessment
Based on available data, the classification criteria are not met for:
STOT RE***

### Carcinogenicity, Mutagenicity, Reproductive toxicity

<table>
<thead>
<tr>
<th>Valeric acid (109-52-4)</th>
<th>Type</th>
<th>Dose</th>
<th>Species</th>
<th>Evaluation</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developmental Toxicity</td>
<td>NOAEL: 750 mg/kg/d (20 d)</td>
<td>rat</td>
<td>OECD 414, Oral</td>
<td>Fetal toxicity, Embryotoxicity</td>
<td></td>
</tr>
<tr>
<td>Developmental Toxicity</td>
<td>NOAEL: 750 mg/kg/d (20 d)</td>
<td>rat</td>
<td>OECD 414, Oral</td>
<td>Teratogenicity</td>
<td></td>
</tr>
<tr>
<td>Developmental Toxicity</td>
<td>LOAEL: 750 mg/kg/d (20 d)</td>
<td>rat</td>
<td>OECD 414, Oral</td>
<td>Maternal toxicity</td>
<td></td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>25 mg/kg (2 weeks), 20 mg/kg (78 weeks), 2x / week</td>
<td>mouse</td>
<td>positive</td>
<td>Skin</td>
<td></td>
</tr>
<tr>
<td>Mutagenicity</td>
<td>Salmonella typhimurium</td>
<td>negative</td>
<td>OECD 471 (Ames)</td>
<td>In vitro study</td>
<td></td>
</tr>
<tr>
<td>Mutagenicity</td>
<td>CHO (Chinese Hamster Ovary) cells</td>
<td>positive</td>
<td>OECD 473 (Chromosomal Aberration)</td>
<td>In vitro study</td>
<td></td>
</tr>
<tr>
<td>Mutagenicity</td>
<td>CHO (Chinese Hamster Ovary) cells</td>
<td>positive</td>
<td>OECD 479 (SCE)</td>
<td>In vitro study</td>
<td></td>
</tr>
<tr>
<td>Mutagenicity</td>
<td>CHO (Chinese Hamster Ovary) cells</td>
<td>negative</td>
<td>OECD 476 (Mammalian Gene Mutation)</td>
<td>In vitro study</td>
<td></td>
</tr>
<tr>
<td>Mutagenicity</td>
<td>mouse</td>
<td>negative</td>
<td>OECD 474</td>
<td>in vivo</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>2-Methylbutyric acid (116-53-0)</th>
<th>Type</th>
<th>Dose</th>
<th>Species</th>
<th>Evaluation</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mutagenicity</td>
<td>Salmonella typhimurium</td>
<td>negative</td>
<td>Ames test</td>
<td>read across</td>
<td></td>
</tr>
<tr>
<td>Developmental Toxicity</td>
<td>NOAEL 600 mg/kg/d</td>
<td>rat</td>
<td>OECD 414, Oral</td>
<td>read across</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2-Methylbutyric acid (116-53-0)</th>
<th>Type</th>
<th>Dose</th>
<th>Species</th>
<th>Evaluation</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mutagenicity</td>
<td>Salmonella typhimurium</td>
<td>negative</td>
<td>OECD 471 (Ames)</td>
<td>read across</td>
<td></td>
</tr>
</tbody>
</table>

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Mutagenicity

<table>
<thead>
<tr>
<th>Developmental Toxicity</th>
<th>mouse</th>
<th>negative</th>
<th>OECD 474</th>
<th>read across</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NOAEL 600 mg/kg/d</td>
<td>rat</td>
<td>OECD 414, Oral</td>
<td>Maternal toxicity, Developmental toxicity, Teratogenicity</td>
</tr>
</tbody>
</table>

Valeric acid, CAS: 109-52-4
CMR Classification
The available data on CMR properties are summarized in the table above. They do not indicate a classification into categories 1A or 1B***

2-Methylbutyric acid, CAS: 116-53-0
CMR Classification
The available data on CMR properties are summarized in the table above. They do not indicate a classification into categories 1A or 1B***

Evaluation
In vitro tests did not show mutagenic effects***

 Isovaleric acid, CAS: 503-74-2
CMR Classification
The available data on CMR properties are summarized in the table above. They do not indicate a classification into categories 1A or 1B***

Evaluation
In vitro tests did not show mutagenic effects

Did not show reprotoxic effects in animal experiments***

Valeric acid, CAS: 109-52-4
Other adverse effects
Components of the product may be absorbed into the body by inhalation and ingestion.

2-Methylbutyric acid, CAS: 116-53-0
Aspiration toxicity
no data available***

 Isovaleric acid, CAS: 503-74-2
Aspiration toxicity
Due to the viscosity, this product does not present an aspiration hazard***

Note
An LC50/inhalation/4h/rat could not be determined because no mortality of rats was observed at the maximum achievable concentration. Handle in accordance with good industrial hygiene and safety practice.

SECTION 12: Ecological information

12.1. Toxicity

Acute aquatic toxicity
Valeric acid (109-52-4)

<table>
<thead>
<tr>
<th>Species</th>
<th>Exposure time</th>
<th>Dose</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daphnia magna (Water flea)</td>
<td>48h</td>
<td>LC50: 88,1 mg/l</td>
<td>OECD 202</td>
</tr>
<tr>
<td>Pseudokirchneriella subcapitata</td>
<td>72h</td>
<td>EC50: 29,3 mg/l</td>
<td>OECD 201</td>
</tr>
<tr>
<td>Pimephales promelas (fathead minnow)</td>
<td>96h</td>
<td>LC50: 39 mg/l</td>
<td>OECD 203</td>
</tr>
</tbody>
</table>

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2-Methylbutyric acid (116-53-0)

<table>
<thead>
<tr>
<th>Species</th>
<th>Exposure time</th>
<th>Dose</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danio rerio (Zebra fish)</td>
<td>96h</td>
<td>LC50: &gt; 1000 mg/l</td>
<td>OECD 203</td>
</tr>
<tr>
<td>Bacteria / Sewage</td>
<td>24h</td>
<td>TTC: 1250 mg/l</td>
<td>ETAD Fermentation tube method</td>
</tr>
</tbody>
</table>

Isovaleric acid (503-74-2)

<table>
<thead>
<tr>
<th>Species</th>
<th>Exposure time</th>
<th>Dose</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pimephales promelas (fathead minnow)</td>
<td>96h</td>
<td>LC50: 77 mg/l</td>
<td>OECD 203 read across</td>
</tr>
<tr>
<td>Daphnia magna (Water flea)</td>
<td>48h</td>
<td>EC50: 51,25 mg/l</td>
<td>DIN 38412, part 11 read across</td>
</tr>
<tr>
<td>Pseudokirchneriella subcapitata</td>
<td>72h</td>
<td>EC50: 29,3 mg/l</td>
<td>OECD 201 read across</td>
</tr>
<tr>
<td>Tetrahymena pyriformis</td>
<td>40 h</td>
<td>IC50: 224 mg/l (Growth inhibition)</td>
<td></td>
</tr>
</tbody>
</table>

12.2. Persistence and degradability

Valeric acid, CAS: 109-52-4
Biodegradation
72.0 % (10 d), activated sludge, non-adapted, aerobic.

2-Methylbutyric acid, CAS: 116-53-0
Biodegradation
67.9 % (10 d), Sewage, domestic, non-adapted, Readily biodegradable, OECD 301 D.

Isovaleric acid, CAS: 503-74-2
Biodegradation
58 - 66 % (8 d), activated sludge, aerobic, non-adapted, OECD 301 C.

12.3. Bioaccumulative potential

Isovaleric acid, CAS: 503-74-2
Bioaccumulative potential
BCF: 3,162
(calculated)
log Pow
1,8 (calculated)

12.4. Mobility in soil

2-Methylbutyric acid, CAS: 116-53-0
No data available***

Isovaleric acid, CAS: 503-74-2
No data available***

Valeric acid (109-52-4)

<table>
<thead>
<tr>
<th>Type</th>
<th>Result</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface tension***</td>
<td>51.6 mN/m (1 g/l @ 20°C)***</td>
<td>OECD 115***</td>
</tr>
</tbody>
</table>
12.5 Other adverse effects

Valeric acid, CAS: 109-52-4
No data available***

2-Methylbutyric acid, CAS: 116-53-0
No data available***

Isovaleric acid, CAS: 503-74-2
No data available***

Note
Avoid release to the environment.

SECTION 13: Disposal considerations

Product Information
Disposal required in compliance with all waste management related state and local regulations. The choice of the appropriate method of disposal depends on the product composition by the time of disposal as well as the local statutes and possibilities for disposal.

Uncleaned empty packaging
Contaminated packaging should be emptied as far as possible and after appropriate cleansing may be taken for reuse.

SECTION 14: Transport information

D.O.T. (49CFR)

14.1. UN number *** UN 3265
14.2. UN proper shipping name *** Corrosive liquid, acidic, organic, n.o.s. (2-Methylbutyric acid / n-Valeric acid)
14.3. Transport hazard class(es) *** 8
14.4. Packing group *** II
14.5. Environmental hazards no***
14.6. Special precautions for user Emergency Response Guide 153

ICAO/IATA

14.1. UN number *** UN 3265
14.2. UN proper shipping name *** Corrosive liquid, acidic, organic, n.o.s. (2-Methylbutyric acid / n-Valeric acid)
14.3. Transport hazard class(es) *** 8
14.4. Packing group *** II
14.5. Environmental hazards no***
14.6. Special precautions for user no data available***
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IMDG

14.1. UN number ***  UN 3265
14.2. UN proper shipping name *** Corrosive liquid, acidic, organic, n.o.s. (2-Methylbutyric acid / n-Valeric acid)
14.3. Transport hazard class(es) *** 8
14.4. Packing group *** II
14.5. Environmental hazards no***
14.6. Special precautions for user *** EmS F-A, S-B
14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code not applicable***

SECTION 15: Regulatory information

Federal and State Regulations
Components of the product are listed in the quoted regulations. For details please refer to the regulations directly. This list is not exhaustive, please check for other applicable regulations.

Federal Regulations
This product is listed on the TSCA inventory

State Regulations
Valeric acid, CAS: 109-52-4
MA RTK List
NY RTK List***
PA RTK List
Isovaleric acid, CAS: 503-74-2
MA RTK List
NJ RTK List***
NY RTK List***

International Inventories
Valeric acid, CAS: 109-52-4
AICS (AU)
DSL (CA)
IECSC (CN)
EC-No. 2036772 (EU)
ENCS (2)-608 (JP)
ISHL (2)-608 (JP)
KECI KE-35263 (KR)
INSQ (MX)
PICCS (PH)

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Version / Revision 2.00***

TSCA (US)
NZIoC (NZ)
TCSI (TW)***

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AICS (AU)
DSL (CA)
IECSC (CN)
EC-No. 2041452 (EU)
ENCS (2)-608 (JP)
ISHL (2)-608 (JP)
KECI KE-23544 (KR)
INSQ (MX)
PICCS (PH)
TSCA (US)
NZIoC (NZ)

ISOvaleric acid, CAS: 503-74-2
AICS (AU)
DSL (CA)
IECSC (CN)
EC-No. 2079753 (EU)
ENCS (2)-608 (JP)
ISHL (2)-608 (JP)
KECI KE-23545 (KR)
INSQ (MX)
PICCS (PH)
TSCA (US)
NZIoC (NZ)
TCSI (TW)***

SECTION 16: Other information

Revision Date 27-May-2015
Issuing date 01-Jun-2015

Hazard Rating Systems

NFPA (National Fire Protection Association)
Health Hazard 3
Fire Hazard 2
Reactivity 0

HMIS (Hazardous Material Information System)
Health Hazard 3
Flammability 2
Physical Hazard 0

Training advice
For effective first-aid, special training / education is needed.

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Sources of key data used to compile the datasheet
Information contained in this safety data sheet is based on Oxea owned data and public sources deemed valid or acceptable. The absence of data elements required by OSHA, ANSI or Annex II, Regulation 1907/2006/EC indicates, that no data meeting these requirements is available.

Further information for the safety data sheet
Changes against the previous version are marked by ***. Observe national and local legal requirements. For more information, other material safety data sheets or technical data sheets please consult the Oxea homepage (www.oxea-chemicals.com).

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End of Safety Data Sheet