Trade name: Avantama N-11

Safety data sheet

1 Identification of the substance/mixture and of the company

1.1 Product identifiers
Trade name: Avantama N-11
Product number: 7027
REACH No.: A registration number is not available for this substance as the substance or its uses are exempted from registration, the annual tonnage does not require a registration or the registration is envisaged for a later registration deadline.

1.2 Relevant identified uses of the substance or mixture
Identified uses: Laboratory chemicals, Manufacture of thin films

1.3 Details of the supplier of the safety data sheet
Distributing company:
Avantama AG
Laubisrüttistrasse 50
8712 Stäfa
Switzerland
Tel.-Nr.: +41 44 927 13 91
Informational: info@avantama.ch

1.4 Emergency telephone number:
Schweizerisches Toxikologisches Informationszentrum (STIZ), Switzerland
Tel.-Nr.: +41 (0)44 251 5151

2 Hazards identification

2.1 Classification of the substance or mixture
For the full text of the H-statements and P-phrases mentioned in this section, see Section 16

Classification according to Regulation (EC) No 1272/2008 [EU-GHS/CLP]
Flammable liquids (cat. 2) H225
Eye irritation (cat. 2) H319
Specific target organ toxicity – single exposure (cat. 3) H336
Acute aquatic toxicity (cat. 1) H400
Chronic aquatic toxicity (cat. 1) H410

Classification systems:
The classification corresponds to the current EC-Lists and is complemented with literature and the company knowledge.

2.2 Label elements
Labeling according to Regulation (EC) Nr. 1272/2008
The product is classified and labeled according to the CLP regulation.

Pictogram

Signal word: Danger
Hazard statement(s)
H225 Highly flammable liquid and vapor
H319 Causes serious eye irritation
H336 May cause drowsiness and dizziness
Trade name: Avantama N-11

H410 Very toxic to aquatic life with long lasting effects

Precautionary statement(s)
P210 Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
P261 Avoid breathing dust/fume/gas/mist/vapors/spray.
P273 Avoid release to the environment.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P501 Dispose of contents/container to an approved waste disposal plant.

2.3 Supplemental Hazard
The applied nanoparticles may be enriched in human body and/or in organisms.

3 Composition / information on ingredients

Chemical characterization: Mixtures
Description: Mixture made of following ingredients including non-hazardous admixtures.

<table>
<thead>
<tr>
<th>CAS:</th>
<th>Name</th>
<th>EC:</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>67-63-0</td>
<td>Isopropanol</td>
<td>200661-7</td>
<td>59-85%</td>
</tr>
<tr>
<td></td>
<td>Flam. Liq. 2; H225; Eye Irrit. 2; STOT SE 3; H319; H336</td>
<td></td>
<td></td>
</tr>
<tr>
<td>64-17-5</td>
<td>Ethanol</td>
<td>200578-6</td>
<td>15-30%</td>
</tr>
<tr>
<td></td>
<td>Flam. Liq. 2; H225</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1314-13-2</td>
<td>Zinc oxide</td>
<td>215222-5</td>
<td>&lt; 10%</td>
</tr>
<tr>
<td></td>
<td>Aquatic Acute 1; H400; Aquatic Chronic 1; H410</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional indication:
Comprised zinc oxide is present as nanoparticles.
For the full text of the H-statements and P-phrases mentioned in this section, see Section 16

4 First aid measures

4.1 Description of first aid measures
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.
In case of eye contact: Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.
If swallowed: Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labeling (see section 2.2) and/or in section 11.

4.3 Indication of any immediate medical attention and special treatment needed.
No data available.

5 Firefighting measures

5.1 Extinguishing media
Unsuitable media: Water jet
Suitable media: CO₂, alcohol-resistant foam, dry chemical

5.2 Special hazards arising from the substance or mixtures
Zinc/ Zinc oxide, Carbon oxide
5.3 Advice for firefighters
Specific protective equipment: Wear self-contained breathing apparatus for fire fighting if necessary. Further information: Use water spray to cool unopened containers. Prevent fire-extinguishing water from contaminating surface water or the ground water system.

6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas.

6.2 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.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal with liquid binding material (chemical binders, sand, diatomite, acid binders, universal binders, sawdust). Then collect by wet-brushing and place in container for disposal according to local regulations. Provide adequate ventilation.

6.4 Reference to other sections
For handling see section 7
For disposal see section 13

7 Handling and storage

7.1 Handling
Precaution for safe handling
Ensure adequate ventilation. Use personal protective equipment. Avoid breathing vapors, mist or gas. Avoid contact with skin and eyes. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas. Usual measures of the preventing fire protection. Avoid formation of aerosols, do not inhale.

7.2 Conditions for safe storage, including any incompatibilities
Storage
Store in cool in place. Keep container tightly closed in a dry and well-ventilated place. Containers, which are opened, must be carefully resealed and kept upright to prevent leakage.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1 no other specific uses are stipulated.
8 Exposure controls/personal protections

Additional indication for technical installation: No data available, see section 7.

8.1 Control parameters

<table>
<thead>
<tr>
<th>Components requiring monitoring of workplace exposure limit values:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Isopropanol (90-100%)</strong></td>
<td></td>
</tr>
<tr>
<td>MAK (Switzerland, (max. workplace concentration)</td>
<td>200 mL/m³</td>
</tr>
<tr>
<td></td>
<td>500 mg/m³</td>
</tr>
<tr>
<td><strong>Zinc oxide (&lt; 10%)</strong></td>
<td></td>
</tr>
<tr>
<td>MAK (Schweiz)</td>
<td>3 mg/m³ (NIOSH, OSHA)</td>
</tr>
<tr>
<td></td>
<td>Inert dust, general dust limit value; inert dust is termed by the current state of scientific knowledge as dust which is not resorbed, no increased formation of connective tissue in lungs (fibrogenic effect) is observed and no specific symptoms of illness are triggered. Such kind of dust may infringe the functionality of the respiratory system by mechanical irritation. Therefore a MAK of 3 mg/m³ of alveolar dust is applied, measured according to EN 481 and also 10 mg/m³ for respirable dust. The here used zinc oxide is not existent in form of dust, but can be inhaled in form as an aerosol.</td>
</tr>
<tr>
<td><strong>Ethanol (15-30%)</strong></td>
<td></td>
</tr>
<tr>
<td>MAK (Switzerland, (max. workplace concentration)</td>
<td>500 ppm</td>
</tr>
<tr>
<td></td>
<td>960 mg/m³</td>
</tr>
</tbody>
</table>

8.2 Exposure controls

**Personal protective equipment**

**General protective and hygienic measures**
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of the day. Keep away from food, beverage and feeding stuff. Take off contaminated clothing immediately.

**Eye/face protection**
Safety glasses with side-shields conforming to EN166. Use equipment for eye protection tested and approved under appropriate government standards.

**Respiratory protection**
For mist /aerosol exposures use respiratory protection. Recommended filter type: ABEK P3

**Skin protection**
Handle with gloves. Use proper glove removal technique 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.

**Glove material**
The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it. Recommended material: Nitrile rubber

**Full contact:**
Minimum layer thickness: 0.4 mm
Break through time: 480 min
Trade name: Avantama N-11

Splash contact
Minimum layer thickness: 0.4 mm
Break through time: 60min

**Body protection**
Type of protective equipment according to risk evaluation.

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

### 9 Physical und 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><strong>General properties</strong></td>
<td></td>
</tr>
<tr>
<td>Appearance</td>
<td>Liquid</td>
</tr>
<tr>
<td>Form:</td>
<td>Liquid</td>
</tr>
<tr>
<td>Color:</td>
<td>Translucent, brownish</td>
</tr>
<tr>
<td>Odor:</td>
<td>Alcohol-like</td>
</tr>
<tr>
<td>Odor threshold:</td>
<td>No data available</td>
</tr>
<tr>
<td>pH:</td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Phase transition</strong></td>
<td></td>
</tr>
<tr>
<td>Melting point/melting range:</td>
<td>No data available</td>
</tr>
<tr>
<td>Initial boiling point/boiling range:</td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Flash point:</strong></td>
<td>12°C</td>
</tr>
<tr>
<td><strong>Flammability (solid, gas):</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Ignition temperature:</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Decomposition temperature:</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Auto-ignition temperature:</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Explosive properties:</strong></td>
<td>No data available</td>
</tr>
<tr>
<td>Explosion limit:</td>
<td></td>
</tr>
<tr>
<td>Lower:</td>
<td>No data available</td>
</tr>
<tr>
<td>Upper:</td>
<td>No data available</td>
</tr>
<tr>
<td>Oxidizing properties</td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Vapor pressure at 20°C:</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Density at 20°C</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Relative density</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Vapor density</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Evaporation rate</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Solubility in / Miscibility with</strong></td>
<td></td>
</tr>
<tr>
<td>Water:</td>
<td>Miscible but not stable</td>
</tr>
<tr>
<td><strong>Partition coefficient:</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Viscosity</strong></td>
<td></td>
</tr>
<tr>
<td>Dynamic:</td>
<td>2-3 mPa s at 23°C</td>
</tr>
<tr>
<td>Kinematic:</td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Solvent content</strong></td>
<td></td>
</tr>
<tr>
<td>Organic solvents:</td>
<td>90-100%</td>
</tr>
<tr>
<td>VOC (EU):</td>
<td>90-100%</td>
</tr>
<tr>
<td>VOCC (CH):</td>
<td>90-100%</td>
</tr>
<tr>
<td><strong>Solid load:</strong></td>
<td>&lt;10%</td>
</tr>
</tbody>
</table>

#### 9.2 Additional safety information:

Primary particle size (dried appearance): 5-50 nm
Particle size (agglomerate size) in Dispersion: <100 nm
Zeta-Potential of nanoparticles is unknown.

Nanoparticle solubility: poorly soluble (0.1 g/L)
Nanoparticles are functionalized.
10 Stability and Reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions

10.3 Thermic decomposition / conditions to avoid:
No decomposition under recommended application.

10.4 Possibility of hazardous reactions
No data available.

10.5 Conditions to avoid
Heat, flames and sparks. Extreme temperatures and direct sunlight

10.6 Incompatible materials
Strong bases, strong oxidizing agents, strong acids, halogenated compounds.

10.7 Hazardous decomposition products
Other decomposition products – no data available.
In the event of fire: See section 5

11 Toxicological information

11.1 Information on toxicological effects

Acute toxicity

<table>
<thead>
<tr>
<th></th>
<th>Classification-relevant LD/LC50 values:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Isopropanol</strong></td>
<td></td>
</tr>
<tr>
<td>Oral</td>
<td>LD50 4'045 mg/kg (rat); Remarks: Behavioral: Altered sleep time and somnolence</td>
</tr>
<tr>
<td>Inhalation</td>
<td>LC50 16'000 mg/kg (rat – 8h)</td>
</tr>
<tr>
<td>Dermal</td>
<td>LD50 12'800 mg/kg (rabbit)</td>
</tr>
<tr>
<td><strong>Zinc oxide</strong></td>
<td></td>
</tr>
<tr>
<td>Oral</td>
<td>LD50 15'000 mg/kg (rat) (OECD 401)</td>
</tr>
<tr>
<td>Inhalative</td>
<td>LC50 5.7 mg/L / 4h (rat) (OECD 401)</td>
</tr>
<tr>
<td><strong>Ethanol</strong></td>
<td></td>
</tr>
<tr>
<td>Oral</td>
<td>LD50 7'060 mg/kg (rat)</td>
</tr>
<tr>
<td>Inhalative</td>
<td>LC50 20'000 mg/kg / 10h (rat)</td>
</tr>
</tbody>
</table>

Primary corrosion/irritation:
Respiratory: May be harmful, may cause irritation of respiratory system by inhalation of aerosol or dust.
Skin (rabbit): Mild skin irritation
Eye (rabbit): Eye irritation – 24h
Sensitzations: No data available
Carcinogenicity: This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification
IARC: 3 – Group 3: Not classifiable as to its carcinogenicity to humans (Isopropanol)

Additional toxicological information:
RTECS: NT8050000
Isopropanol: Central nervous system depression, prolonged or repeated exposure can cause: Nausea, headache, vomiting, narcosis, drowsiness, and overexposure may cause mild, reversible liver effects. Kidney – Irregularities – Based on human evidence.

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.
12 Ecological information

12.1 Toxicity
Aquatic Toxicity:

Isopropanol:
  LC50: 9'640 mg/L – 96h (Pimephales promelas)
  EC50: 5'102 mg/L – 24h (Daphnia magna)
  Immobilization EC50: 6'851 mg/L – 24h (Daphnia magna)
  EC50: ≥ 2'000 mg/L -72h (Desmodesmus subspicatus)
  EC50: ≥ 1'000 mg/L -24h (Algae)

Zinc oxide:
  LC50: >320 mg/l / 96 h (Lepomis macrochirus)
  1.1 mg/l / 96 h (Oncorhynchus mykiss)
  2'246 mg/l / 96 h (Pimephales promelas)
  EC50: 2.2 mg/l / 48 h (Daphnia magna)
  IC50: 136 mg/l / 72 h (Selenastrum capricornutum) (OECD 201)
  NOEC:0.025 mg/l (Clupea harengus) (27 d, OECD 215)
  0.04 mg/l (Oncorhynchus mykiss) (30 d, OECD 215)
  NOEC: 0.011 mg/l (Pseudokirchneriella subcapitata) (5 d, OECD 201)

Ethanol:
  LC50 – 14'200 mg/L / 96h (Pimephales promelas)
  LC50 – 5'012 mg/L / 48h (Ceriodaphnia dubia)
  NOEC – 9.6 mg/mL / 9d (Daphnia magna)
  EC50 – 275 mg/L / 72h (Chlorella vulgaris)

12.2 Persistence and degradability
Isopropanol: Biodegradability: 95% - 21d
Zinc oxide: No data available

12.3 Behavior in environmental compartments:
Bio-accumulative potential: No data available.
Mobility in soil: No data available.

12.4 Additional ecological indication:
General indication: Do not let product enter drains, surface water or the ground water system. Discharge into the environment must be avoided.

12.5 Results of PBT- and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted.

12.6 Other adverse effects
Very toxic to aquatic life.

13 Disposal considerations

13.1 Waste treatment methods
Recommendation: Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting, as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company.

13.2 Contaminated packaging
Recommendation: Dispose of as unused product
Recommended detergent: Ethanol
## 14 Transport information

### Land transport ADR/RID and GGVSEB (cross-border/interior):

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADR/RID-GGVSEB class:</td>
<td>3 flammable liquid</td>
</tr>
<tr>
<td><strong>UN number:</strong></td>
<td>1993</td>
</tr>
<tr>
<td>Packing group:</td>
<td>II</td>
</tr>
<tr>
<td>Hazard label:</td>
<td>3</td>
</tr>
<tr>
<td>UN proper shipping name:</td>
<td>Flammable liquid, N.O.S. (Isopropanol, Ethanol, Zinc oxide)</td>
</tr>
<tr>
<td>Tunnel restriction code</td>
<td>D/E</td>
</tr>
<tr>
<td>Transport hazard class(es):</td>
<td>3</td>
</tr>
</tbody>
</table>

### Sea shipment IMDG/GGVSee

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMDG/GGVSee class:</td>
<td>3 flammable liquid</td>
</tr>
<tr>
<td><strong>UN number:</strong></td>
<td>1993</td>
</tr>
<tr>
<td>Hazard label:</td>
<td>3</td>
</tr>
<tr>
<td>Packing group:</td>
<td>II</td>
</tr>
<tr>
<td>EMS code:</td>
<td>F-E, S-E</td>
</tr>
<tr>
<td>Marine pollutant:</td>
<td>Yes</td>
</tr>
<tr>
<td>UN proper shipping name:</td>
<td>Flammable liquid, N.O.S. (Isopropanol, Ethanol, Zinc oxide)</td>
</tr>
</tbody>
</table>

### Air transport ICAO-TI und IATA-DGR

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICAO/IATA class:</td>
<td>3</td>
</tr>
<tr>
<td><strong>UN/ID number:</strong></td>
<td>1993</td>
</tr>
<tr>
<td>Hazard label:</td>
<td>3</td>
</tr>
<tr>
<td>Packing group:</td>
<td>II</td>
</tr>
<tr>
<td>UN proper shipping name:</td>
<td>Flammable liquid, N.O.S. (Isopropanol, Ethanol, Zinc oxide)</td>
</tr>
</tbody>
</table>

## 15 Regulatory information

Chemical Safety Assessment: For this product a chemical safety assessment was not carried out
Trade name: Avantama N-11

16 Other information

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. Avantama Ltd shall not be held liable for any damage resulting from handling or from contact with the above product. This safety data sheet contains nano-specific information.

16.1 H-statements
H225 Highly flammable liquid and vapor
H319 Causes serious eye irritation
H336 May cause drowsiness and dizziness
H400 Very toxic to aquatic life
H410 Very toxic to aquatic life with long lasting effects

16.2 Precautionary statement(s)
P210 Keep away from heat/ sparks/ open flames/ hot surfaces. – No smoking.
P261 Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.
P273 Avoid release to the environment.
P280 Wear protective gloves protective clothing eye protection face protection
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P501 Dispose of contents/ container to an approved waste disposal plant.

16.3 Abbreviation and acronyms:
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
RID: Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Concerning the International Transport of Dangerous Goods by Rail)
IATA: International Air Transport Association
IATADGR: Dangerous Goods Regulations by the "International Air Transport Association" (IATA)
IARC: International agency for research of cancer
ICAO: International Civil Aviation Organization
ICAO-TI: Technical Instructions by the "International Civil Aviation Organization" (ICAO)
IMDG: International Maritime Code for Dangerous Goods
GHS: Globally Harmonized System of Classification and Labeling of Chemicals
VOCV: Lenkungsabgabe auf flüchtigen organischen Verbindungen, Schweiz (Swiss Ordinance on volatile organic compounds)
VOC: Volatile Organic Compounds (USA, EU)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
EC50: half maximal effective concentration
Eye irrit.: Eye irritation
Flam. Liq.: Flammable liquids
STOT SE: Specific target organ toxicity – single exposure