



# MATERIAL SAFETY DATA SHEET

## Crotonaldehyde

### 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

**PRODUCT NAME:** Crotonaldehyde

**SYNONYM:** 2-Butenaldehyde

**MOLECULAR FORMULA:** C<sub>4</sub>H<sub>6</sub>O

**MOLECULAR WEIGHT:** 70.09 g/mol

**CREATION DATE:** Mar 02 2007

**CONTACT PERSON:**

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**REVISION DATE:** Jan 13 2016

### 2. HAZARDS IDENTIFICATION

This substance is classified based on Directive 1272/2008/EC and its amendments (CLP Regulation, GHS).\*\*\*

Classification

**Hazards**

**Category**

Flammable liquid

Category 2

Acute oral toxicity

Category 3

Acute dermal toxicity

Category 1

Acute inhalation toxicity

Category 2

Skin corrosion/irritation

Category 2

Serious eye damage/eye irritation

Category 1

Germ cell mutagenicity	Category 2
Specific target organ systemic toxicity (single exposure)	Category 3
Specific target organ systemic toxicity (repeated exposure)	Category 2
Acute aquatic toxicity	Category 1

### **Hazard Statements**

H225 - Highly flammable liquid and vapor  
H301 - Toxic if swallowed  
H311 – Toxic if there is contact with skin  
H330 - Fatal if inhaled  
H315 - Causes skin irritation  
H318 - Causes serious eye damage  
H341 - Suspected of causing genetic defects  
H335 - May cause respiratory irritation  
H373 - May cause damage to organs through prolonged or repeated exposure  
H400 - Very toxic to aquatic life  
\*\*\*

### **Precautionary Statements**

P201 - Obtain special instructions before use  
P202 - Do not handle until all safety precautions have been read and understood  
P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking  
P273 - Avoid release to the environment  
P281 - Use personal protective equipment as required  
P284 - Wear respiratory protection  
P308 + P313 - IF exposed or concerned: Get medical advice/ attention  
\*\*\*

Other Hazards : The substance does not meet the criteria for PBT / vPvB according to REACH, Annex XIII

### **Classification and labelling (according to Directive 67/548/EWG or 1999/45/EC)**

This substance is classified and labelled according to Annex I of Directive 67/548/EEC, as amended\*\*\*

<b>Indication of danger</b>	Mutagenic. CAT. 3 Highly flammable Very Toxic Dangerous for the environment
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<b>R-Phrase(s)</b>	R11	-Highly flammable.
	R24/25	-Toxic in contact with skin and if swallowed.
	R26	-Very toxic by inhalation.
	R37/38	-Irritating to respiratory system and skin.
	R41	-Risk of serious damage to eyes.
	R48/22	-Harmful: danger of serious damage to health by prolonged exposure If swallowed.
	R50	-Very toxic to aquatic organisms.
	R68	-Possible risks of irreversible effects.

**S-Phrase(s)**

S26	- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S28.2	- After contact with skin, wash immediately with plenty of soap and water.
S36/37/39	- Wear suitable protective clothing, gloves and eye/face protection
S45	- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible)
S61	- Avoid release to the environment. Refer to special instructions/Safety data sheets***

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### 3. COMPOSITION, INFORMATION ON INGREDIENTS

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CAS No.	EC No.	Chemical Name	Percent
4170-30-3	224-030-0	Crotonaldehyde	>99

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### 4. FIRST AID MEASURES

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**General Information**

Remove contaminated, soaked clothing immediately and dispose of safely. Pay attention to own protection. In any case show the physician the Safety Data Sheet.  
 Inhalation Keep at rest. Move to fresh air. Call a physician immediately.

**Skin**

Wash off immediately with soap and plenty of water removing all contaminated clothes and shoes. Obtain medical attention.

**Eyes**

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Call a physician immediately.

### **Ingestion**

If swallowed give 1-2 glasses of water to drink immediately. Call a physician immediately\*\*\*

### **Notes to physician (Main symptoms)**

Vapors may cause irritation to the eyes, respiratory system and the skin.

### **Special hazard respiratory disorder.**

Treatment Treat symptomatically. In case of lung irritation first treatment with dexametason aerosol (spray). If ingested, irrigate the stomach.

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## **5. FIRE FIGHTING MEASURES**

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### **Suitable extinguishing media**

Foam, Dry chemical, Carbon dioxide (CO<sub>2</sub>)

### **Extinguishing media which must not be used for safety reasons**

Do not use a solid water stream as it may scatter and spread fire\*\*\*

### **Special exposure hazards arising from the substance or preparation itself, its combustion products, or released gases**

Under conditions giving incomplete combustion, hazardous gases produced may consist of carbon monoxide carbon dioxide (CO<sub>2</sub>)

Combustion gases of organic materials must in principle be graded as inhalation poisons\*\*\*

### **Special protective equipment for fire-fighters**

self-contained breathing apparatus (EN 133).

### **Environmental precautions**

Dike and collect water used to fight fire.\*\*\*

### **Other Information**

Cool containers / tanks with water spray.

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## **6. ACCIDENTAL RELEASE MEASURES**

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### **Personal precautions**

Avoid contact with the skin and the eyes. Keep away from heat and sources of ignition. Provide adequate ventilation.

**Environmental precautions**

Prevent further leakage or spillage. Do not discharge into the drains/surface waters/groundwater.

**Methods for cleaning up**

Soak up with inert absorbent material. Do not use rags, paper towels or combustible materials to clean up a spill, because spontaneous combustion can occur. Keep in suitable, closed containers for disposal. Dispose of in accordance with local regulations.

**Additional information**

Consult trained personnel. Consider the information for "Personal Protection" in chapter 8 of this Safety Data Sheet\*\*\*

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## 7. HANDLING AND STORAGE

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**Handling**

## 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 safe handling

Vapors may form explosive mixtures with air. The pressure in sealed containers can increase under the influence of heat. Refill and handle product only in closed system. Provide sufficient air exchange and/or exhaust in work rooms.

## Incompatible products

Keep away from: Acids, bases, amines, oxygen, oxidizing agents, reducing agents\*\*\*

## Protection - fire and explosion:

Keep away from sources of ignition - No smoking. Vapours are heavier than air and may spread along floors. Take necessary action to avoid static electricity discharge. Ground and bond containers when transferring material. In case of fire, emergency cooling with water spray should be available\*\*\*

Reduce the release of the substance or mixture to the environment See Section 8: Environmental exposure controls

## Temperature class

T4

**Storage**

## Material storage

The product will oxidize in air and release heat. Oxidization creates acids and peroxides, that may lead to corrosive damages in storage and handling equipment\*\*\*

**Incompatible products**

Keep away from: Acids, bases, amines, oxygen, oxidizing agents, reducing agents\*\*\*

**Technical measures/Storage conditions**

Keep tightly closed in a dry, cool and well-ventilated place. Handle and open container with care. Store under nitrogen\*\*\*

**German storage class**

3A: Flammable liquids.

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## 8. EXPOSURE CONTROLS, PERSONAL PROTECTION

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**EC Exposure Limit Values**

No exposure limits established.\*\*\*

National occupational exposure limits (Germany)

**DFG MAK List**

Skin designation : Components of the product may be absorbed into the body through the skin

<b>Components</b>	<b>Carcinogenic</b>	<b>Mutagenic</b>	<b>Embryonic Toxin</b>	<b>Toxic to reproduction</b>
Crotonaldehyde	3B	3B		

**ACGIH Exposure Limits****Components Ceiling Limit Value:**

Crotonaldehyde	0.3 PPM
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**DNELs**

Acute - Systemic Effect

Worker (oral)	: not required
Worker (dermal)	: 0.2 mg/kg bw/d
Worker (inhalation)	: 0.86 mg/m <sup>3</sup>
General Population (oral)	: not required
General Population (dermal)	: not required
General Population (inhalation)	: not required

Acute - Local Effect

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Worker (oral)	: not required
Worker (dermal)	: 1.12 µg/cm <sup>2</sup>
Worker (inhalation)	: 0.86 mg/m <sup>3</sup>
General Population (oral)	: not required
General Population (dermal)	: not required
General Population (inhalation)	: not required

#### Long-term - Systemic Effects

Worker (oral)	: not required
Worker (dermal)	: 0.1 mg/kg bw/d
Worker (inhalation)	: 0.3 mg/m <sup>3</sup>
General Population (oral)	: not required
General Population (dermal)	: not required
General Population (inhalation)	: not required

#### Long-term - Local Effects

Worker (oral)	: not required
Worker (dermal)	: 0.56 µg/cm <sup>2</sup>
Worker (inhalation)	: 0.86 mg/m <sup>3</sup>
General Population (oral)	: not required
General Population (dermal)	: not required
General Population (inhalation)	: not required

#### PNECs

Environment (water)	: 0.000494 mg/l
Environment (air)	: not required
Environment (soil)	: 0.00694 mg/kg soil dw
Environment (sediment)	: 0.000614 mg/kg sediment dw
Environment (STP)	: 10.4 mg/l

#### Exposure controls

This substance is registered as isolated intermediates

This Material Safety Data Sheet complies with the specific requirements which justify the registration according to Reach regulation, Article 17 and 18

#### Engineering measures

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.

Personal protective equipment

### **General advice**

Avoid contact with skin and eyes. Do not breathe vapors or spray mist\*\*\*

### **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\*\*\*

### **Respiratory protection**

Respirator with A filter. Full mask with above mentioned filter according to producers using requirements or self-contained breathing apparatus. Equipment should conform to EN 136 or EN 140 and EN 143\*\*\*

### **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. Equipment should conform to EN 166\*\*\*

### **Skin protection**

Impervious clothing\*\*\*

### **Hand protection**

Chemicals resistant gloves

Suitable material : butyl-rubber  
Type : Butoject (Company KCL) or comparable article; or refer to glove manufacturer's recommendation  
Evaluation : according to EN 374: level 4  
Material thickness : approx. 0.7 mm  
Break through time : approx. 120 min

Suitable material : butyl-rubber  
Type : Butoject (Company KCL) or comparable article; or refer to glove manufacturer's recommendation  
Evaluation : according to EN 374: level 3  
Material thickness : approx. 0.3 mm  
Break through time : approx. 60 min

The times listed are suggested by measurements taken at 22 °C and constant contact. Temperatures raised by warmed substances, body heat, etc. and a weakening of the effective layer thickness caused by expansion can lead to a significantly shorter breakthrough time. In case of doubt contact the gloves' manufacturer. A 1.5-times increase / decrease in the layer thickness doubles / halves the breakthrough time. This data only applies to the pure substance. Transferred to mixtures of substances, these figures should only be taken as an aid to orientation.

**Environmental exposure controls**

Do not discharge into the drains/surface waters/groundwater

**Environmental Precautions**

Should not be released into the environment

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**9. PHYSICAL AND CHEMICAL PROPERTIES**

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<b>Form:</b>	liquid***
<b>Color:</b>	Yellowish
<b>Odor:</b>	pungent
<b>Odor Threshold:</b>	No Data Available
<b>Flash point:</b>	13°C – Closed cup
<b>Ignition temperature:</b>	No Data Available
<b>Decomposition Temperature:</b>	No Data Available
<b>Lower explosion limit:</b>	No Data Available
<b>Upper explosion limit:</b>	No Data Available
<b>Melting point/range:</b>	No Data Available
<b>Boiling point/range:</b>	101 – 102 ***°C @ 1013 hPa
<b>Density:</b>	0.852 g/ml @ 20°C
<b>pH:</b>	No Data Available
<b>Viscosity:</b>	No Data Available
<b>Vapor pressure:</b>	No Data Available
<b>Vapor density:</b>	No Data Available

<b>Evaporation Rate:</b>	No Data Available
<b>Water solubility:</b>	181 g/l @ 20°C
<b>Solubility in other solvents:</b>	miscible with, Benzene, very soluble in, Ethanol, Diethyl ether, Acetone***
<b>Partition coefficient: (n-octanol/water)</b>	0.60 (calculated)
<b>Explosive Properties:</b>	not applicable based on consideration of the structure***
<b>Oxidizing Properties:</b>	not applicable based on consideration of the structure***
<b>Surface Tension:</b>	No Data Available
<b>Dissociation constant:</b>	No Data Available

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## 10. STABILITY AND REACTIVITY

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### Reactivity

Stable if protected from heat and exposure to air.\*\*\*

### Chemical Stability

No decomposition if used as directed.

### Possibility of hazardous reactions

May form explosive peroxides. Polymerization can occur. Polymerization is a highly exothermic reaction and may generate sufficient heat to cause thermal decomposition and/or rupture containers.

### Conditions to avoid

Avoid any source of ignition. Avoid contact with heat, sparks, open flame, and static discharge.

### Incompatible Materials

Keep away from: oxygen, oxidizing agents, reducing agents, acids, bases

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## 11. TOXICOLOGICAL INFORMATION

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<b>Acute oral toxicity</b>	LD50: 174 mg/kg
Species	Rat
Method	OECD 420
<b>Acute dermal toxicity</b>	LD50: 26 mg/kg
Species	guinea pig
<b>Acute inhalation toxicity</b>	LC50 (4h): 336 mg/m <sup>3</sup>
Species	rat, male
Method	OECD 403
<b>Skin corrosion/irritation</b>	Irritating
Species	Rabbit
<b>Serious eye damage/eye irritation</b>	highly irritating
Species	Humans
<b>Skin Sensitization</b>	nonsensitizer***
Species	mouse, female
 <b>in vitro Mutagenicity</b>	 Ames Test: positive - with and without metabolic activation - Method: OECD 471 Cytogenicity Assay in Chinese hamster cells: positive - with and without metabolic activation - Method: OECD 473 DNA Damage and Repair in hepatocytes: positive - without metabolic activation - Method: OECD 487 In vitro Sister Chromatid Exchange Assay in Chinese Hamster Ovary (CHO): positive - with and without metabolic activation - Method: OECD 479***
 <b>in vivo Mutagenicity</b>	 Sex-linked Recessive Lethal Test in Drosophila Melanogaster: negative and positive results - Method: OECD 477 Mammalian Erythrocyte Micronucleus Test in mice: negative - Method: OECD 474 Mammalian Bone Marrow Chromosome Aberration Test in mice: positive - Method: OECD 475 Rodent Dominant Lethal test in mice: positive - Method:

	OECD 478
	Mammalian Spermatogonial Chromosome Aberration Test
	in mice: positive - Method: OECD 483
<b>Carcinogenic effects</b>	No evidence of carcinogenicity***
<b>Reproductive toxicity</b>	No toxicological effects to fertility or offspring
<b>Routes of exposure</b>	oral gavage***
Species	Rat
Method	OECD 415
	NOAEL: 10 mg/kg bw/day

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## 12. ECOLOGICAL INFORMATION

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<b>Acute fish toxicity</b>	LC50: 0.65 mg/l (96h)
	Species: Oncorhynchus mykiss (rainbow trout)
	Method: EPA OTS 797.1400
<b>Chronic fish toxicity</b>	NOEC (41d): 0.0247 mg/l
	Species: Oryzias Latipes (Medaka)
	Method: OECD 210
<b>Acute daphnia toxicity</b>	EC50: 2 mg/l (48h)
	Species: Daphnia magna
	Method: EPA OTS 797.1300
<b>Toxicity to aquatic plants</b>	EC50: < 0.881 mg/l (96h)
	Species: Pseudokirchneriella subcapitata
	Method: EPA OTS 797.1050
<b>Toxicity to bacteria</b>	EC10: 10.4 mg/l (18h)
	Species: Pseudomonas putida
	Method: DIN 38412 T.8
<b>Biodegradation</b>	Readily biodegradable (but failed the 10-day window criterion)
	Method: EPS OTS 796.3200
<b>Bioaccumulation</b>	Does not bioaccumulate
<b>Other potential hazards</b>	The substance does not meet the criteria for PBT / vPvB according to REACH, Annex XIII

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## 13. DISPOSAL CONSIDERATIONS

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### 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.

## 14. TRANSPORT INFORMATION

### ADR/RID

UN/ID No.	UN 1143
Proper Shipping Name	Crotonaldehyde
Hazard Class	6.1
Subsidiary Risk	3
Classification Code	TF1
Packing group	I
Environmentally hazardous	yes
Tunnel Restriction Code	(C/D)
Hazard Label(s)	6.1 + 3 + Fish and tree
Hazard Number	663

### ADNR

ADNR	Container and Tanker
UN/ID No.	UN 1143
Proper Shipping Name	Crotonaldehyde
Hazard Class	6.1
Subsidiary Risk	3
Classification Code	TF1
Packing group	I
Environmentally hazardous	yes
Hazard Labels	6.1 + 3 + Fish and tree

### ICAO/IATA

FORBIDDEN

### IMDG

UN/ID No.	UN 1143
Proper Shipping Name	Crotonaldehyde
Hazard Class	6.1
Subsidiary Risk	3
Packing group	I
Marine pollutant	yes
Hazard Labels	6.1 + 3 + Fish and tree
EMS Code	F-E, S-D

## 15. REGULATORY INFORMATION

Directive 1996/82/EC

Annex I, part 2

**Water Hazard Class (WGK):**

WGK Class	3
WGK Reg. No.	239
WGK Source	Classification according to VwVwS, Annex 1 or 2***

**International Inventories**

Listed on the chemical inventories of the following countries or qualifies for an exemption:

Australia (AICS)  
Canada (DSL)  
China (IECSC)  
Europe (EINECS)  
Japan (ENCS)  
Japan (ISHL)  
Korea (KECI)  
New Zealand (NZIoC)  
Philippines (PICCS)  
United States (TSCA)\*\*\*

**Chemical Safety Assessment:**

Chemical Safety Assessment (CSA) is not required\*\*\*

**Authorization - Reach Regulation, Title VII**

This substance is not subject to authorization requirements\*\*\*

**Restrictions - Reach Regulation, Titel VIII**

This substance meets the criteria for Annex XVII, No.40\*\*\*

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## 16. OTHER INFORMATION

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**Other Information:**

- Observe national and local legal requirements
- Changes against the previous version are marked by \*\*\*

**Training advice**

Make sure that employees are aware of the hazards / risks as detailed on this Safety Data Sheet. When wearing a breathing apparatus, the need for appropriate training needs to be considered\*\*\*

**Sources of key data used to compile the datasheet**

Information contained in this safety data sheet is based on data from public sources deemed valid or acceptable. The absence of data elements required by ANSI or 1907/2006/EC indicates that no data meeting these requirements is available\*\*\*

Abbreviation and Acronym:

ADR = Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)  
CAS = Chemical Abstracts Service (division of the American Chemical Society)  
CLP = Classification, Labelling and Packaging  
DNEL = Derived No Effect Level  
EINECS = European Inventory of Existing Commercial Chemical Substances  
GHS = Globally Harmonized System of Classification and Labelling of Chemicals  
IATA = International Air Transport Association  
IBC Code = International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IMO)  
ICAO = International Civil Aviation Organization  
IMDG = International Maritime Code for Dangerous Goods  
LC50 = Lethal Concentration  
LD50 = Lethal Dose  
LOAEC = Low Observed Adverse Effect Concentration  
LOAEL = Low Observed Adverse Effect Level  
LOEL = Low Observed Effect Level  
MEST = Mouse Ear Swelling Test  
NOAEC = No Observed Adverse Effect Concentration  
NOAEL = No Observed Adverse Effect Level  
NOEC = No Observed Effect Concentration  
NOEL = No Observed Effect Level  
PBT = Persistent, Bioaccumulative and Toxic  
PNEC = Predicted No Effect Concentration  
RCR = Risk Characterization Ratio  
RID = Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Concerning the International Transport of Dangerous Goods by Rail)  
R-Phrases = Risk Phrases  
S-Phrases = Safety Phrases  
STOT RE = Specific Target Organ Toxicity Repeated Exposure  
STOT SE = Specific Target Organ Toxicity Single Exposure  
STP = Sewage Treatment Plant  
vPvB = very Persistent and very Bioaccumulative\*\*\*

The information in this safety data sheet is based on data and samples provided. The sheet was written to the best of our ability and according to the state of knowledge at that time. The safety data sheet only constitutes a guideline for the safe handling, use, consumption, storage, transport and disposal of the substances/preparations/mixtures mentioned under point 1. New safety data sheets are written from time to time. Only the most recent versions may be used. Old versions must be destroyed. Unless indicated otherwise word for word on the safety data sheet, the information does not apply to substances/preparations/mixtures in purer form, mixed with other substances or in processes.

The safety data sheet offers no quality specification for the substances/preparations/mixtures in question. Compliance with the instructions in this safety data sheet does not release the user from the obligation to take all measures

dictated by common sense, regulations and recommendations or which are necessary and/or useful based on the real applicable circumstances. Godavari Biorefineries Limited does not guarantee the accuracy or exhaustiveness of the information provided.