

[FOREWORD](#)

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DODECANEDIOIC ACID
CAS N°: 693-23-2

Substance

End Point : IDENTIFIERS, PHYSICAL AND CHEMICAL PROPERTIES
Chemical Name : Dodecanedioic acid
Common Name : Dodecanedioic acid
CAS Number : 693-23-2

Synonyms

Decamethylenedicarboxylic acid	1,10-Decanedicarboxylic acid
1,10-Dicarboxydecane	n-Dodecanedioic acid
1,12-Dodecanedioic acid	SL-AH

Properties & Definitions

Molecular Formula : C₁₂H₂₂O₄
Molecular Weight : 230.30
Melting Point : 128C
Boiling Point : 250C at 10 mmHg
Vapour Pressure : *
Octanol/Water Partition Coefficient : log Pow = 3.07 calculated
Water Solubility : 30 mg/L at 23C
Impurities : Degree of purity 100%
General Comments : *Vapour pressure is reported as: Log (VP-mmHg) (-4.968) 25C.

Overall Evaluation

SIDS INITIAL ASSESSMENT

PRESENTLY OF LOW CONCERN

Dodecanedioic acid (DDDA) is manufactured in a closed system and used internally by the producer for the manufacturer of polyamides as the acid half of the nylon molecule. Other uses include polyamide hot melt adhesives and corrosion inhibitors.

DDDA is solid at room temperature, has a low vapor pressure, and low water solubility. It is readily biodegradable and has a low order of ecotoxicity.

DDDA has low toxicity by skin and oral routes. It is an eye irritant but not a skin irritant. Genotoxicity was negative. No significant reproductive or developmental effects were noted in the combined protocol. Epididymal weights were slightly increased and no effect on performance was noted. In addition, decreased mean total leukocyte counts (not statistically significant) were observed in mid and high dose males. These changes were noted in the absence of both morphological alterations in the spleen and decreases in thymus weights, and normal globulin concentrations. These changes are attributed to decreases in lymphocyte counts with no evidence of immunological compromise. The potential for human exposure is limited and toxicity is low.

Production-Trade

Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Production

Quantity Year
5000-25000 t - P

References

!SIDSP*
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High
Production Volume Chemicals Programme, (1994)

Uses

Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Use

<u>Quantity</u>	<u>Year</u>	<u>Comments</u>
		Chemical intermediate Examples of use categories are dyestuffs, intermediates, solvents, adhesives, building material agents, detergents, cleaning agents, fertilisers, plastic agents, surface treatment agents, etc. Polyamides Type of uses are divided into three: industrial use (open system and closed system), public use and export. Industrial use - closed system

References

Secondary References : **!SIDSP***
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

Study

End Point : **CONCENTRATION**
Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Test Subject

Organism Medium Specification Lifestage Sex
AIR **OCC**

Test Results

Matrix Concentrations Spec. Date
45.4 kg **1Y**

Approximately 100 pounds/year (45.4 kg/year) to the atmosphere from the bag filter.

There are unquantified releases to the atmosphere from the bagging and hopper car operations. The bagging operation is ventilated. These releases are both relatively small.

Some DDDA is contained in the waste stream that goes to the disposal wells but this has not been quantified either.

General Comments : The release occurs to the atmosphere. To control the release, bag filter is efficiency 99.5% or better.

References

Secondary Reference : **!SIDSP***
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High
Production Volume Chemicals Programme, (1994)

Study

End Point : **HUMAN INTAKE AND EXPOSURE**
Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Test Subject

Organism Medium Specification Route Lifestage Sex

HUMAN

Test Results

Intake Spec. Date

The bagging and hopper car loading operations are the only jobs with direct routine potential exposure. Other potential exposures are incidental ones resulting from operations and maintenance.

This is a closed process and except for the bagging and hopper car loading operations exposures are incidental from leaks and/or maintenance. A dust mask and coveralls are used by the bagging operator. The process vent which contains DDDA dust has a bag filter on it.

The DDDA process has several steps and only in the final one is there a potential for DDDA exposure. Since jobs are rotated, all 50 operators are potentially exposed over a several year period. Similarly, all 31 mechanics assigned to the process may work in the final operation and be exposed.

Therefore total potentially exposed personnel is 81. Of these, 5 are involved in the bagging and hopper car loading operations at any given time.

References

Secondary Reference : **!SIDSP***
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High
Production Volume Chemicals Programme, (1994)

Study

End Point : **BIODEGRADATION**
Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Species/strain/system : Test medium: water, water-sediment, soil, sewage treatment

Test Method and Conditions

Test method description : Closed Flask-Test

(An)aerobic : **AEROB**

Test Results

Quantity Time

71 %

References

Primary Reference : **#URHUL***
Huls AG Unpublished Report

Secondary Reference : **!SIDSP***
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High
Production Volume Chemicals Programme, (1994)

Study

End Point : **MAMMALIAN ACUTE TOXICITY**
Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Test Method and Conditions

Test method description : GLP: yes

Test Results

<u>Organism</u>	<u>Medium</u>	<u>Spec.</u>	<u>Route</u>	<u>Lifestage</u>	<u>Sex</u>	<u>Effect</u>	<u>Effect Comments</u>
RAT			ORL		M F	LD50	LD50 was greater than 3000 mg/kg.

References

Primary Reference : **#URHUL***
 Huls AG Unpublished Report, 1465, (1989)

Secondary Reference : **!SIDSP***
 OECD/SIDS. Screening Information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

Study

End Point : **MAMMALIAN ACUTE TOXICITY**
Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Species/strain/system : Albino rabbits

Test Method and Conditions

Test method description : GLP: yes

Test Results

<u>Organism</u>	<u>Medium</u>	<u>Spec.</u>	<u>Route</u>	<u>Lifestage</u>	<u>Sex</u>	<u>Effect</u>	<u>Effect Comments</u>
RBT			SKN		M	LD50	LD50 was greater than 6000 mg/kg.

References

Primary Reference : **#UREID***
 E. I. Du Pont de Nemours & Company Inc. Unpublished Report, HLR 921-80, (1980)

Secondary Reference : **!SIDSP***
 OECD/SIDS. Screening Information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

Study

End Point : **MAMMALIAN TOXICITY**
Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Test Subject

Organism Medium Specification Route Lifestage Sex Number exposed Number controls

RAT **ORL** **M**

Species/strain/system : Sprague-Dawley rats

Test Method and Conditions

Test method description : Not specified

Exposure

Dose / Concentration : **2250-17000 mg/kg**

Test Results

Approximate lethal Dose (ALD) was greater than 17000 mg/kg.

References

Primary Reference : **#UREID***
E. I. Du Pont de Nemours & Company Inc. Unpublished Report, HLR 51-64, (1964)

Secondary Reference : **!SIDSP***
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

Study

End Point : **MAMMALIAN TOXICITY**
Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Test Subject

Organism Medium Specification Route Lifestage Sex Number exposed Number controls

RAT **ORL** **M**

Species/strain/system : Sprague-Dawley rats (ChR-CD)

Test Method and Conditions

Test method description : 14 Days Repeated Dose Oral Toxicity Study; with satellite 14 days recovery periods.

Exposure

Exposure Period : **14 d**
Frequency : **5 x/wk**
Exposure comments : 5 times per week for 2 weeks.

Test Results

<u>Organ</u>	<u>Effect</u>	<u>Rev.</u>	<u>OnSet</u>	<u>Sex</u>	<u>Affected in Exposed - Controls</u>
	NOEL				
NOEL: 5000 mg/kg/day					
<i>General Comments</i>	: Dodecanedioic acid did not show any evidence of cumulative toxicity: no histopathological lesions were attributed to administration of dodecanedioic acid.				

References

Primary Reference : **#UREID***
E. I. Du Pont de Nemours & Company Inc. Unpublished Report, (1964)

Secondary Reference : **!SIDSP***
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

Study

End Point : **MAMMALIAN TOXICITY**
Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Test Subject

Organism Medium Specification Route Lifestage Sex Number exposed Number controls

RAT **ORL** **M**
F

Species/strain/system : Rat (CrI: CD BR)

Test Method and Conditions

Test method description : OECD Combined Repeated Dose and Reproductive/Developmental Toxicity Screening Test; GLP: yes

Exposure

Dose / Concentration : **100-1000 mg/kg**
Exposure comments : Dose levels: 0, 100, 500 or 1000 mg/kg.

Test Results

<i>Organ</i>	<i>Effect</i>	<i>Rev.</i>	<i>OnSet</i>	<i>Sex</i>	<i>Affected in Exposed - Controls</i>
-----	-----	-----	-----	-----	-----

NOEL

NOEL (Repro/Developmental) = 1000 mg/kg. Compound related effects were limited to mild decreases in leukocyte (lymphocyte) counts.

NOEL

NOEL = 100 mg/kg (males), 500 mg/kg (females).

NOAEL

NOAEL for males and females was 1000 mg/kg.

References

Primary Reference : **#UREID***
 E. I. Du Pont de Nemours & Company Inc. Unpublished Report, HLR 229-92

Secondary Reference : **!SIDSP***
 OECD/SIDS. Screening Information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

Study

End Point : **MUTAGENICITY**
Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Test Subject

Organism Medium Specification Route Lifestage Sex Number exposed Number controls

BACT **VTR**

Species/strain/system : Salmonella typhimurium TA1535, TA1537, TA1538, TA98, TA100

Test Method and Conditions

Test method description : Ames Test; GLP: yes

Exposure

Dose / Concentration : **10-5000 ug PLATE**

Test Results

<i>Organ</i>	<i>Effect</i>	<i>Rev.</i>	<i>OnSet</i>	<i>Sex</i>	<i>Affected in Exposed - Controls</i>
-----	-----	-----	-----	-----	-----
	NEF				

Not mutagenic at 5000 ug/plate with and without metabolic activation. Toxicity occurs at 500 ug/plate and above.

References

Primary Reference : **#URHUL***
Huls AG Unpublished Report, 88/69, (1989)

Secondary Reference : **!SIDSP***
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

Study

End Point : **MUTAGENICITY**
Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Test Subject

Organism Medium Specification Route Lifestage Sex Number exposed Number controls

MOUSE **M**
F

Species/strain/system : Mice Crl:CD - 1(ICR)BR

Test Method and Conditions

Test method description : Mouse Bone Marrow Micronucleus Assay, complies with OECD and EPA Guidelines; GLP: yes

Test Results

<i>Organ</i>	<i>Effect</i>	<i>Rev.</i>	<i>OnSet</i>	<i>Sex</i>	<i>Affected in Exposed - Controls</i>
-----	-----	-----	-----	-----	-----
BMW	NEF				

Dodecanedioic acid did not induce micronuclei; the test material is negative. Lowest dose producing toxicity: greater than 5000 mg/kg.

General Comments : No statistically significant increases in the frequency of micronucleated PCE's were observed at any sampling time. No significant depression in the ratio of young, polychromatic erythrocytes to mature, normochromatic erythrocytes were observed.

References

Primary Reference : **#UREID***
E. I. Du Pont de Nemours & Company Inc. Unpublished Report, HLR 379-92

Secondary Reference : **!SIDSP***
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

Study

End Point : **SENSITIZATION**
Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Test Subject

Organism Medium Specification Route Lifestage Sex Number exposed Number controls

GPIG **SKN** **F**

Species/strain/system : Guinea pig

Test Method and Conditions

Test method description : Magnussen Kligman; GLP: yes

Test Results

<i>Organ</i>	<i>Effect</i>	<i>Rev.</i>	<i>OnSet</i>	<i>Sex</i>	<i>Affected in Exposed - Controls</i>
-----	-----	-----	-----	-----	-----
SKIN	NEF				
Not a skin sensitizer					
<i>General Comments</i> : Intracutaneously at 0.5%. Epidermally at 25 and 50%.					

References

Primary Reference : **#URHUL***
Huls AG Unpublished Report, 1468, (1989)

Secondary Reference : **!SIDSP***
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

Study

End Point : **IRRITATION**
Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Test Subject

Organism Medium Specification Route Lifestage Sex Number exposed Number controls

RBT **SKN** **M**

Species/strain/system : Rabbits

Test Method and Conditions

Test method description : GLP: yes

Exposure

Exposure Period : **4 h**

Test Results

<i>Organ</i>	<i>Effect</i>	<i>Rev.</i>	<i>OnSet</i>	<i>Sex</i>	<i>Affected in Exposed - Controls</i>
-----	-----	-----	-----	-----	-----
SKIN	NEF				

Not irritating to skin. Irritation index: 0/8.

References

Primary Reference : **#URHUL***
Huls AG Unpublished Report, 1466, (1989)

Secondary Reference : **!SIDSP***
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

Study

End Point : **IRRITATION**
Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Test Subject

Organism Medium Specification Route Lifestage Sex Number exposed Number controls

RBT **SKN** **M**

Species/strain/system : Albino rabbits

Test Method and Conditions

Test method description : FHSA Method; observations made at 24 and 48 hours and graded according to Federal Hazardous Substances Act.

Exposure

Dose / Concentration : **0.5 g**

Test Results

<i>Organ</i>	<i>Effect</i>	<i>Rev.</i>	<i>OnSet</i>	<i>Sex</i>	<i>Affected in Exposed - Controls</i>
SKIN	NEF				

No skin irritation was observed at any time.

References

Primary Reference : **#UREID***
E. I. Du Pont de Nemours & Company Inc. Unpublished Report, HLR 344-76, (1976)

Secondary Reference : **!SIDSP***
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

Study

End Point : **IRRITATION**
Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Test Subject

<i>Organism</i>	<i>Medium</i>	<i>Specification</i>	<i>Route</i>	<i>Lifestage</i>	<i>Sex</i>	<i>Number exposed</i>	<i>Number controls</i>
RBT			EYE		M		

Species/strain/system : Rabbits

Test Method and Conditions

Test method description : GLP: yes

Test Results

<i>Organ</i>	<i>Effect</i>	<i>Rev.</i>	<i>OnSet</i>	<i>Sex</i>	<i>Affected in Exposed - Controls</i>
EYE	IRRIT				

Slight irritation to eyes. Irritation index: 11.96/110.

References

Primary Reference : **#URHUL***
Huls AG Unpublished Report, 1467, (1989)

Secondary Reference : **!SIDSP***
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

Study

End Point : **IRRITATION**
Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Test Subject

Organism Medium Specification Route Lifestage Sex Number exposed Number controls

RBT **EYE**

Species/strain/system : Albino rabbits

Test Method and Conditions

Test method description : Not specified

Test Results

Produced a small area of slight corneal opacity and mild conjunctival irritation with no significant irritic effect. Corneal opacity was reversible and eye normal within 7 days.

References

Primary Reference : **#UREID***
E. I. Du Pont de Nemours & Company Inc. Unpublished Report, HLR 316-76, (1976)

Secondary Reference : **!SIDSP***
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

Study

End Point : **REPRODUCTION**
Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Test Subject

Organism Medium Specification Route Lifestage Sex Number exposed Number controls

RAT M
F

Species/strain/system : Rats (CrI: CD BR)

Test Method and Conditions

Test method description : OECD Combined Repeated Dose and Reproductive/Developmental Toxicity Screening Test; GLP: yes

Exposure

Dose / Concentration : **100-1000 mg/kg**
Exposure comments : Dose levels: 0, 100, 500 or 1000 mg/kg.

Test Results

<i>Organ</i>	<i>Effect</i>	<i>Rev.</i>	<i>OnSet</i>	<i>Sex</i>	<i>Affected in Exposed - Controls</i>
-----	-----	-----	-----	-----	-----
NOEL					

NOEL (Repro/Development) = 1000 mg/kg. Compound related effects were limited to mild decreases in leukocyte (lymphocyte) counts.

NOEL

NOEL = 100 mg/kg (males), 500 mg/kg (females).

NOAEL

NOAEL for males and females was 1000 mg/kg.

References

Primary Reference : **#UREID***
E. I. Du Pont de Nemours & Company Inc. Unpublished Report, HLR 229-92

Secondary Reference : **!SIDSP***
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

Study

End Point : **AQUATIC ACUTE TOXICITY**
Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Test Method and Conditions

Test method description : Structural Activity Relationship (SAR)

Test Results

Organism Medium Spec. Route Lifestage Sex Effect Effect Comments

LC50

General Comments : The aquatic toxicity Structural Activity Relationship (SAR) for dodecanedioic acid quoted by Du Pont was done by EPA- EEB/HERD in Jan, 1991: fish 96-h LC50 = 200.0 mg/L, daphnid 48-h LC50 = 220.0 mg/L, green algal 96-h EC50 = 150.0 mg/L, fish chronic value (ChV) = 20.0 mg/L, daphnid ChV = 20.0 mg/L, and algal ChV = 25.0 mg/L.

References

Secondary Reference : **!SIDSP***
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

Study

End Point : **AQUATIC TOXICITY**
Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Test Subject

Organism Medium Specification Route Lifestage Sex Number exposed Number controls

ALGAE AQ FRESH

Species/strain/system : Green algae (Scenedesmus subspicatus)

Test Method and Conditions

Test method description : Assimilation German Industry Std. 38-412 Part 12.

Exposure

Exposure Period : **24 h**

Test Results

<i>Organ</i>	<i>Effect</i>	<i>Rev.</i>	<i>OnSet</i>	<i>Sex</i>	<i>Affected in Exposed - Controls</i>
-----	-----	-----	-----	-----	-----
	EC0				

EC0 for 24 hours was greater than 15.3 mg/L. Inhibition of oxygen release was measured.

References

Primary Reference : **#URHUL***
Huls AG Unpublished Report

Secondary Reference : **!SIDSP***
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

Study

End Point : **AQUATIC TOXICITY**
Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Test Subject

Organism Medium Specification Route Lifestage Sex Number exposed Number controls

ALGAE AQ FRESH

Species/strain/system : Green algae (Scenedesmus subspicatus)

Test Method and Conditions

Test method description : Algae Growth Inhibition Test (draft UBA proposal as of 2/84)

Exposure

Exposure Period : 72 h

Test Results

<i>Organ</i>	<i>Effect</i>	<i>Rev.</i>	<i>OnSet</i>	<i>Sex</i>	<i>Affected in Exposed - Controls</i>
-----	-----	-----	-----	-----	-----
	EC0				

EC0 for 72 hours was greater than 5.8 mg/L. Inhibition of cell multiplication was measured.

References

Primary Reference : **#URHUL***
Huls AG Unpublished Report

Secondary Reference : **!SIDSP***
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

Study

End Point : **AQUATIC TOXICITY**
Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Test Subject

<i>Organism</i>	<i>Medium</i>	<i>Specification</i>	<i>Route</i>	<i>Lifestage</i>	<i>Sex</i>	<i>Number exposed</i>	<i>Number controls</i>
-----	-----	-----	-----	-----	-----	-----	-----
CRUS	AQ	FRESH					

Species/strain/system : Water flea (Daphnia magna)

Test Method and Conditions

Test method description : Germany Industrial Std. 38-412 Part 11.

Exposure

Exposure Period : 24 h

Test Results

<i>Organ</i>	<i>Effect</i>	<i>Rev.</i>	<i>OnSet</i>	<i>Sex</i>	<i>Affected in Exposed - Controls</i>
-----	-----	-----	-----	-----	-----
	EC0				

EC0 for 24 hours was greater than 27.6 mg/L.

General Comments : Test criteria was loss of swimming capacity

References

Primary Reference : **#URHUL***
Huls AG Unpublished Report

Secondary Reference : **!SIDSP***
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High
Production Volume Chemicals Programme, (1994)

Study

End Point : **AQUATIC TOXICITY**

Chemical Name : **Dodecanedioic acid**

CAS Number : **693-23-2**

Test Subject

Organism Medium Specification Route Lifestage Sex Number exposed Number controls

FISH **AQ** **FRESH**

Species/strain/system : Golden orfe (Leuciscus idus)

Test Method and Conditions

Test method description : Germany Industrial Std. 38-412 Part 15; GLP: yes

Exposure

Exposure Period : **48 h**

Test Results

<i>Organ</i>	<i>Effect</i>	<i>Rev.</i>	<i>OnSet</i>	<i>Sex</i>	<i>Affected in Exposed - Controls</i>
-----	-----	-----	-----	-----	-----
	LC0				

LC0 for 48 hours was greater than 1000 mg/L.

References

Primary Reference : **#URHUL***
Huls AG Unpublished Report

Secondary Reference : **!SIDSP***
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High
Production Volume Chemicals Programme, (1994)

Substance

Chemical Name : **Dodecanedioic acid**
CAS Number : **693-23-2**

Treatment & Disposal DP

Incineration

References

Secondary Reference : **!SIDSP***
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High
Production Volume Chemicals Programme, (1994)

Substance



Chemical Name :
Reported Name : **DECANE-1,10-DICARBOXYLIC ACID**
CAS Number : **693-23-2**

Area *Type* *Subject* *Spec.* *Description* *Level / Summary Information* :

RUS REG AIR OCC **MAC** CLV: 10MG/M3 (AEROSOL) HAZ. CLASS: III
CLASS *Title* :

Reference _____ : *Effective Date* : 1JAN1989

Last Amendment : GOSTS*, 12.1.005, 1988 *Entry / Update* : MAY1990
 GOSUDARSTVENNYI STANDART SSSR
 (STATE STANDARD OF USSR)

