SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Oxidation-C
MSDS Number	:	000000011427
Product Use Description	:	Oxidation Reagent for DNA/RNA Synthesis
Manufacturer or supplier's details	:	Honeywell International Inc. 115 Tabor Road Morris Plains, NJ 07950-2546
For more information call	:	1-800-368-0050 +1-231-726-3171 (Monday-Friday, 9:00am-5:00pm)
In case of emergency call	:	**Medical: 1-800-498-5701 or +1-303-389-1414**
	:	**Transportation (CHEMTREC): 1-800-424-9300 or +1-703-527-3887**
	:	
	:	(24 hours/day, 7 days/week)

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Form	:	liquid, clear
Color	:	red
Odor	:	ether-like

Classification of the substance or mixture

Classification of the substance or mixture	:	Flammable liquids, Category 2 Acute toxicity, Category 4, Oral Eye irritation, Category 2A Carcinogenicity, Category 2 Specific target organ toxicity - single exposure, Category 3, Respiratory system

GHS Label elements, including precautionary statements

Symbol(s) :

Signal word : Danger

Hazard statements : Highly flammable liquid and vapour.
Harmful if swallowed.
Causes serious eye irritation.
May cause respiratory irritation.
Suspected of causing cancer.

Precautionary statements : **Prevention:**
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ ventilating/ lighting/ equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
Wash skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Wear protective gloves/ eye protection/ face protection.

Response:
IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell.
IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
IF exposed or concerned: Get medical advice/ attention.

Rinse mouth.
If eye irritation persists: Get medical advice/ attention.
In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.

Storage:
Store in a well-ventilated place. Keep container tightly closed.
Keep cool.
Store locked up.

Disposal:
Dispose of contents/ container to an approved waste disposal plant.

Carcinogenicity

ACGIH:	Tetrahydrofuran A3: Confirmed animal carcinogen	109-99-9
	Pyridine A3: Confirmed animal carcinogen	110-86-1

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature : Mixture

Chemical Name	CAS-No.	Concentration
Tetrahydrofuran	109-99-9	89.00 %
Water	7732-18-5	10.00 %
Pyridine	110-86-1	0.40 %
Iodine	7553-56-2	0.20 %

SECTION 4. FIRST AID MEASURES

Inhalation	:	Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Use oxygen as required, provided a qualified operator is present. Call a physician.
Skin contact	:	Wash off immediately with plenty of water for at least 15 minutes. Take off contaminated clothing and shoes immediately. Wash contaminated clothing before re-use. Call a physician.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Call a physician.
Ingestion	:	Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Call a physician.

Notes to physician

Treatment	:	Treat symptomatically.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Carbon dioxide (CO2) Dry chemical Alcohol-resistant foam Cool closed containers exposed to fire with water spray.
Unsuitable extinguishing media	:	Do not use a solid water stream as it may scatter and spread fire.
Specific hazards during firefighting	:	Extremely flammable. Vapours may form explosive mixtures with air. Vapours are heavier than air and may spread along floors. Vapors may travel to areas away from work site before igniting/flashing back to vapor source. In case of fire hazardous decomposition products may be produced such as: Hydrogen cyanide (hydrocyanic acid) Ammonia Carbon dioxide (CO2), carbon monoxide (CO), oxides of nitrogen (NOx), dense black smoke.

Special protective equipment for firefighters	:	Wear self-contained breathing apparatus and protective suit.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear personal protective equipment. Immediately evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Ensure adequate ventilation. Remove all sources of ignition. Do not swallow. Avoid breathing vapours, mist or gas. Avoid contact with skin, eyes and clothing.
Environmental precautions	:	Prevent further leakage or spillage if safe to do so. Prevent product from entering drains. Discharge into the environment must be avoided. Do not flush into surface water or sanitary sewer system. Do not allow run-off from fire fighting to enter drains or water courses.
Methods for cleaning up	:	Ventilate the area. No sparking tools should be used. Use explosion-proof equipment. Contain and collect spillage with non-combustible absorbent materials, e.g. sand, earth, vermiculite, diatomaceous earth and place in container for disposal according to local regulations (see section 13).

SECTION 7. HANDLING AND STORAGE

Handling

Handling	:	Wear personal protective equipment. Use only in well-ventilated areas. Keep container tightly closed. Do not smoke. Do not swallow. Avoid breathing vapours, mist or gas. Avoid contact with skin, eyes and clothing.

Advice on protection against fire and explosion	:	Keep away from fire, sparks and heated surfaces. Take precautionary measures against static discharges. Ensure all equipment is electrically grounded before beginning transfer operations. Keep product and empty container away from heat and sources of ignition. No sparking tools should be used. Use explosion-proof equipment. No smoking.

Storage

Requirements for storage areas and containers	:	Store in area designed for storage of flammable liquids. Protect from physical damage. Keep containers tightly closed in a dry, cool and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Keep away from heat and sources of ignition. Keep away from direct sunlight. Store away from incompatible substances. Container hazardous when empty. Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Protective measures	:	Ensure that eyewash stations and safety showers are close to the workstation location.
Engineering measures	:	Use with local exhaust ventilation. Prevent vapour buildup by providing adequate ventilation during and after use.
Eye protection	:	Do not wear contact lenses. Wear as appropriate: Safety glasses with side-shields If splashes are likely to occur, wear: Goggles or face shield, giving complete protection to eyes
Hand protection	:	Solvent-resistant gloves Gloves must be inspected prior to use.

Replace when worn.

Skin and body protection : Wear as appropriate:
Solvent-resistant apron
Flame retardant antistatic protective clothing
If splashes are likely to occur, wear:
Protective suit

Respiratory protection : In case of insufficient ventilation wear suitable respiratory equipment.
For rescue and maintenance work in storage tanks use self-contained breathing apparatus.
Use NIOSH approved respiratory protection.

Hygiene measures : When using, do not eat, drink or smoke.
Wash hands before breaks and immediately after handling the product.
Keep working clothes separately.
Remove and wash contaminated clothing before re-use.
Do not swallow.
Avoid breathing vapours, mist or gas.
Avoid contact with skin, eyes and clothing.

Exposure Guidelines

Components	CAS-No.	Value	Control parameters	Update	Basis
Tetrahydrofuran	109-99-9	SKIN_DES : Skin designation:	Can be absorbed through the skin.	2008	ACGIH:US. ACGIH Threshold Limit Values
Tetrahydrofuran	109-99-9	TWA : time weighted average	(50 ppm)	2008	ACGIH:US. ACGIH Threshold Limit Values
Tetrahydrofuran	109-99-9	STEL : Short term exposure limit	(100 ppm)	2008	ACGIH:US. ACGIH Threshold Limit Values

Tetrahydrofuran	109-99-9	REL : Recommended exposure limit (REL):	590 mg/m3 (200 ppm)	2005	NIOSH/GUIDE:US. NIOSH: Pocket Guide to Chemical Hazards
Tetrahydrofuran	109-99-9	STEL : Short term exposure limit	735 mg/m3 (250 ppm)	2005	NIOSH/GUIDE:US. NIOSH: Pocket Guide to Chemical Hazards
Tetrahydrofuran	109-99-9	PEL : Permissible exposure limit	590 mg/m3 (200 ppm)	02 2006	OSHA_TRANS:US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)
Tetrahydrofuran	109-99-9	STEL : Short term exposure limit	735 mg/m3 (250 ppm)	1989	Z1A:US. OSHA Table Z-1-A (29 CFR 1910.1000)
Tetrahydrofuran	109-99-9	TWA : time weighted average	590 mg/m3 (200 ppm)	1989	Z1A:US. OSHA Table Z-1-A (29 CFR 1910.1000)
Pyridine	110-86-1	TWA : time weighted average	(1 ppm)	2008	ACGIH:US. ACGIH Threshold Limit Values
Pyridine	110-86-1	REL : Recommended exposure limit (REL):	15 mg/m3 (5 ppm)	2005	NIOSH/GUIDE:US. NIOSH: Pocket Guide to Chemical Hazards

Pyridine	110-86-1	PEL : Permissible exposure limit	15 mg/m3 (5 ppm)	02 2006	OSHA_TRANS:US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Pyridine	110-86-1	TWA : time weighted average	15 mg/m3 (5 ppm)	1989	Z1A:US. OSHA Table Z-1-A (29 CFR 1910.1000)

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state : liquid, clear

Color : red

Odor : ether-like

pH : Note: not determined

Melting point/freezing point : -108.5 °C

Boiling point/boiling range : ca. 66 °C

Flash point : < 43 °F (6 °C)

Lower explosion limit : 2 %(V)
Note: The physical data is that of the main component.

Upper explosion limit : 11.8 %(V)
Note: The physical data is that of the main component.

Vapor pressure : 189 hPa

Density	:	ca. 0.888 g/cm3
Water solubility	:	Note: completely soluble
Ignition temperature	:	321 °C Method: The physical data is that of the main component.

SECTION 10. STABILITY AND REACTIVITY

Chemical stability	:	Stable under recommended storage conditions.
Possibility of hazardous reactions	:	Reacts with air to form peroxides. Hazardous polymerisation does not occur.
Conditions to avoid	:	Heat, flames and sparks. Keep away from direct sunlight. Protect from exposure to air/oxygen (peroxide formation). Protect against light.
Incompatible materials to avoid	:	Strong acids and strong bases Strong oxidizing agents May form explosive peroxides. May attack many plastics, rubbers and coatings.
Hazardous decomposition products	:	Peroxides In case of fire hazardous decomposition products may be produced such as: Hydrogen iodide (HI) Ammonia Hydrogen cyanide (hydrocyanic acid) Carbon dioxide (CO2), carbon monoxide (CO), oxides of nitrogen (NOx), dense black smoke.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute oral toxicity

Tetrahydrofuran	:	LD50: 1,650 mg/kg Species: rat
Pyridine	:	LD50: 891 mg/kg Species: rat
Iodine	:	LD50: 14,000 mg/kg Species: rat

Acute inhalation toxicity

Tetrahydrofuran	:	LC50: ca. 61.9 mg/l 21000 ppm Exposure time: 3 h Species: rat
Pyridine	:	LC50: 8796 ppm Exposure time: 1 h Species: rat
Iodine	:	LC50: > 4.588 mg/l , dust/mist Exposure time: 4 h Species: rat

Acute dermal toxicity

Pyridine	:	LD50: 1,121 mg/kg Species: rabbit
Iodine	:	LD50: 1,425 mg/kg Species: rabbit, male

Skin irritation

Tetrahydrofuran	:	Species: rabbit Result: Irritating to skin.
Iodine	:	Species: reconstructed human epidermis (RhE) Result: Irritating to skin.

Eye irritation

Tetrahydrofuran : Species: rabbit
Result: Irritating to eyes.

Pyridine : Species: rabbit
Result: Severe eye irritation
Note: Corneal opacity

Repeated dose toxicity

Pyridine : Species: rat
Application Route: Inhalation
Target Organs: Liver
(10 or 50 ppm; 7 hours/day, 5 days/week for 6 months)
Based on experimental results, may cause adverse health effects on the following:
Liver

Species: rat
Application Route: Oral
NOEL: 1 mg/kg
Target Organs: Liver, Kidney
Causes damage to the following organs: liver, kidneys.

Iodine : Species: human
Chronic toxicity
Chronic absorption can cause iodism, resulting in metallic taste, burning in the mouth and throat, and soreness of teeth and gums.
Other symptoms include rapid heartbeat, tremor, weight loss, diarrhea, insomnia, eye irritation, bronchitis, gastric irritation, and skin rash.

Pyridine : Test Method: Ames test
Result: negative

: Test Method: Chromosome aberration test in vitro
Cell type: Chinese Hamster Ovary Cells
Result: negative

: Test Method: Cell Transformation Test
Result: negative

Teratogenicity

Iodine : Species: rat
Application Route: Oral
Dose: TDLo value of 1100 mg/kg for effects on newborn viability index
Number of exposures: females dosed during days 1 to 22 of pregnancy

Species: rabbit
Application Route: Oral
Dose: TDLo value of 15 mg/kg for effects on newborn viability index and for effects on newborn growth statistics (e.g., reduced weight gain)
Number of exposures: females dosed during days 30 to 31 of pregnancy

Further information

Tetrahydrofuran : Note:
Confirmed animal carcinogen with unknown relevance to humans.

Pyridine : Note:
Confirmed animal carcinogen with unknown relevance to humans.

SECTION 12. ECOLOGICAL INFORMATION

Toxicity to fish

Tetrahydrofuran : LC50: 2,160 mg/l
Exposure time: 96 h
Species: Fathead minnow

LC50: 2,820 mg/l
Species: Leuciscus idus (Golden orfe)

Pyridine : flow-through test
LC50: 106 mg/l
Exposure time: 96 h
Species: Pimephales promelas (fathead minnow)

Iodine	:	LC50: 1.67 mg/l Exposure time: 96 h Species: Oncorhynchus mykiss (rainbow trout)

Toxicity to daphnia and other aquatic invertebrates

Iodine	:	LC50: 0.55 mg/l Exposure time: 48 h Species: Daphnia magna (Water flea)

Toxicity to algae

Iodine	:	Growth inhibition EC50: 0.13 mg/l Exposure time: 72 h Species: Desmodesmus subspicatus (green algae) Method: OECD Test Guideline 201

Toxicity to bacteria

Tetrahydrofuran	:	LC50: > 580 mg/l Exposure time: 16 h Species: Bacteria

Further information on ecology

Additional ecological information

Pyridine	:	Harmful to aquatic organisms.
Iodine	:	Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods	:	Observe all Federal, State, and Local Environmental regulations.

SECTION 14. TRANSPORT INFORMATION

DOT UN/ID No. : UN 1993

	Proper shipping name	:	Flammable liquids, n.o.s. (Tetrahydrofuran, Pyridine)
	Class		3
	Packing group		II
	Hazard Labels		3
IATA	UN/ID No.	:	UN 1993
	Description of the goods	:	Flammable liquids, n.o.s. (Tetrahydrofuran, Pyridine)
	Class	:	3
	Packaging group	:	II
	Hazard Labels	:	3
	Packing instruction (cargo aircraft)	:	364
	Packing instruction (passenger aircraft)	:	353
	Packing instruction (passenger aircraft)	:	Y341
IMDG	UN/ID No.	:	UN 1993
	Description of the goods	:	Flammable liquids, n.o.s. (PYRIDINE, TETRAHYDROFURAN)
	Class	:	3
	Packaging group	:	II
	Hazard Labels	:	3
	EmS Number	:	F-E, S-E
	Marine pollutant	:	no

SECTION 15. REGULATORY INFORMATION

Inventories

US. Toxic Substances Control Act	:	On TSCA Inventory
Australia. Industrial Chemical (Notification and Assessment) Act	:	On the inventory, or in compliance with the inventory
Canada. Canadian Environmental Protection Act (CEPA). Domestic	:	All components of this product are on the Canadian DSL.

Substances List (DSL)

Japan. Kashin-Hou Law List	:	On the inventory, or in compliance with the inventory
Korea. Toxic Chemical Control Law (TCCL) List	:	On the inventory, or in compliance with the inventory
Philippines. The Toxic Substances and Hazardous and Nuclear Waste Control Act	:	On the inventory, or in compliance with the inventory
China. Inventory of Existing Chemical Substances	:	On the inventory, or in compliance with the inventory
New Zealand. Inventory of Chemicals (NZIoC), as published by ERMA New Zealand	:	On the inventory, or in compliance with the inventory

National regulatory information

US. Drug Enforcement Administration (DEA) Listed Precursor and Essential Chemicals (21 CFR 1310)	:	On the United States Drug Enforcement Authority (DEA) List of Precursors and Essential Chemicals	
	:		
	:	Iodine	7553-56-2
US. EPA CERCLA Hazardous Substances (40 CFR 302)	:	The following component(s) of this product is/are subject to release reporting under 40 CFR 302 when release exceeds the Reportable Quantity (RQ):	
		Reportable quantity: 1000 lbs	
	:	Tetrahydrofuran	109-99-9
	:	Pyridine	110-86-1
SARA 302 Components	:	SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.	
SARA 313 Components	:	SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.	

SARA 311/312 Hazards	:	Fire Hazard Acute Health Hazard Reactivity Hazard Chronic Health Hazard
CERCLA Reportable Quantity	:	1124 lbs
California Prop. 65	:	WARNING! This product contains a chemical known to the State of California to cause cancer. Pyridine 110-86-1

Massachusetts RTK	:	Tetrahydrofuran	109-99-9
	:	Pyridine	110-86-1
	:	Iodine	7553-56-2
New Jersey RTK	:	Tetrahydrofuran	109-99-9
	:	Pyridine	110-86-1
	:	Iodine	7553-56-2
Pennsylvania RTK	:	Tetrahydrofuran	109-99-9
	:	Pyridine	110-86-1
	:	Iodine	7553-56-2

WHMIS Classification	:	B2: Flammable liquid D2B: Toxic Material Causing Other Toxic Effects D2A: Very Toxic Material Causing Other Toxic Effects This product has been classified according to the hazard criteria of the CPR and the MSDS contains all of the information required by the CPR.

SECTION 16. OTHER INFORMATION

		HMIS III	NFPA
Health hazard	:	2*	2
Flammability	:	3	3
Physical Hazard	:	1	

Instability : 1

* - Chronic health hazard

Hazard rating and rating systems (e.g. HMIS® III, NFPA): This information is intended solely for the use of individuals trained in the particular system.

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text. Final determination of suitability of any material is the sole responsibility of the user. This information should not constitute a guarantee for any specific product properties.

Changes since the last version are highlighted in the margin. This version replaces all previous versions.
Previous Issue Date: 07/10/2011
Prepared by Honeywell Performance Materials and Technologies Product Stewardship Group