REVISION DATE: 1/JAN/2015, VERSION 11.

SECTION I: IDENTIFICATION OF THE SUBSTANCE OR MIXTURE AND OF THE SUPPLIER

GHS PRODUCT IDENTIFIER

NAME
HIKOREZ A-1100

CHEMICAL FAMILY
PETROLEUM HYDROCARBON RESIN

CAS NUMBER
64742-16-1

RECOMMENDED USE OF THE CHEMICAL AND RESTRICTIONS ON USE:

RECOMMENDED USE
ADDITIVE FOR ADHESIVES, PAINTS, COATINGS, INKS

RESTRICTIONS ON USE
USED FOR RECOMMENDED USE.

MANUFACTURER/IMPORTER/SUPPLIER INFORMATION

SUPPLIER NAME
KOLON INDUSTRIES

ADDRESS
15TH FL, KOLON TOWER, KOLON-RO 11,
GWACHEON-CITY, GYEONGGO-DO, KOREA (427-709)

TELEPHONE / FAX
(82) 2 3677 6124 / (82) 2 3677 6191

EMERGENCY TELEPHONE
(82) 2 3677 6124

SECTION 2: HAZARDS IDENTIFICATION

CLASSIFICATION

ANNEX I OF DIRECTIVE 67/548/EEC
NOT CLASSIFIED

EU CLP 2008
NOT CLASSIFIED

NFPA
HEALTH = 1  FIRE =1  REACTIVITY = 0 (0 = NO HAZARD, 1 = SLIGHT HAZARD)
SECTION 3: COMPOSITION, INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>CAS NUMBER</th>
<th>Weight % Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>PETROLEUM HYDROCARBON RESIN</td>
<td>64742-16-1</td>
<td>&gt;99.8</td>
</tr>
<tr>
<td>STABILIZER</td>
<td>PROPRIETARY</td>
<td>&lt;0.2</td>
</tr>
</tbody>
</table>

SECTION 4: FIRST AID MEASURES

EYE CONTACT
FLUSH EYES WITH AMOUNT OF WATER FOR AT LEAST 15 MINUTES.
GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT
GET MEDICAL ATTENTION IF NEEDED.
DRI AND WASH THOROUGHLY CONTAMINATED CLOTHING AND SHOES BEFORE REUSE.
REMOVE CONTAMINATED CLOTHING AND SHOES. WASH IMMEDIATELY SKIN WITH SOAP AND WATER FOR AT LEAST 15 MINUTES.

INHALATION
GIVE ARTIFICIAL RESPIRATION IF VICTIM IS NOT BREATHING.
MOVE VICTIM TO NON-CONTAMINATED PLACE IF SIDE EFFECT OCCURRED.
GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION
GET MEDICAL ATTENTION IF SWALLOWED AMOUNT OF SUBSTANCE.

OTHER NOTES FOR PHYSICIAN
THERE IS NOT SPECIFIC ANTIDOTE. TAKE FUNCTIONALLY MEASURES ACCORDING TO SYMPTOMS.

SECTION 5: FIRE FIGHTING MEASURES

SUITABLE (AND UNSUITABLE) EXTINGUISHING MEDIA

SUITABLE EXTINGUISHING MEDIA
DRY CHEMICAL, CO₂, WATER SPRAY, REFULAR FOAM

UNSUITABLE EXTINGUISHING MEDIA
NOT AVAILABLE

IN CASE OF MAJOR FIRE AND LARGE QUANTITIES
USE REGULAR EXTINGUISHING AGENT AND FINE WATER SPRAY.

SPECIFIC HAZARDS ARISING FROM THE CHEMICAL

THERMAL DECOMPOSITION PRODUCTS
CARBON OXIDES, NITROGEN OXIDES

FIRE AND EXPLOSIVE HAZARD
IT COULD BE A SLIGHT FIRE HAZARD.

SPECIAL PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIRE-FIGHTERS
MOVE CONTAINERS FROM FIRE AREA IF YOU
DO NOT SCATTER SPILLED MATERIAL WITH HIGH PRESSURE WATER STREAMS.
MAKE AN EMBANKMENT FOR FURTHER PROCESSING.
USE EXTINGUISHING AGENT SUITABLE FOR TYPE OF SURROUNDING FIRE.
AVOID INHALATION OF THE SUBSTANCE OR COMBUSTION PRODUCTS. STAY UPWIND AND KEEP OUT OF LOW AREAS.

SECTION 6: ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES
KEEP AWAY FROM WATERWAYS AND SEWERS.
ISOLATE EXPOSED AREA.
KEEP UNAUTHORIZED PERSONNEL AWAY.
MOVE MATERIALS TO SUITABLE CONTAINERS FOR LATER DISPOSAL.

ENVIRONMENTAL PRECAUTIONS AND PROTECTIVE PROCEDURES
ATMOSPHERE
NOT AVAILABLE

LAND
NOT AVAILABLE

UNDERWATER
DO NOT RELEASE SPILLAGE INTO SEWERS.

THE METHODS OF PURIFICATION AND REMOVAL
SMALL SPILL
DISPOSE WASTE AS WASTE SYNTHESIS RESIN (GENERAL WASTE).

LARGE SPILL
COLLECT AND THEN RECYCLE OR DISPOSE AS A WASTE RESIN (GENERAL WASTE).

SECTION 7: HANDLING AND STORAGE

PRECAUTIONS FOR SAFE HANDLING
PREVENT SKIN AND EYE CONTACT
AVOID CONTACT IN THE MOLTEN STATE BY HEAT AND VAPOR INHALATION.
WHEN STATIC ELECTRICITY GENERATES, REMOVE BY GROUNDING, CLEANING WORK SPACE, AND USING ARTICLES PREVENTING ELECTRIFICATION.

CONDITIONS FOR SAFE STORAGE
MINIMIZE GENERATION AND ACCUMULATION OF DUST
STORE IN A COOL, DRY AND WELL-VENTILATED AREA.
AVOID CONTACT WITH STRAIGHT SUNLIGHT.
STORE AND USE BY REGULATION OF CENTRAL GOVERNMENT AND LOCAL SELF-GOVERNMENT.

SECTION 8: EXPOSURE CONTROLS, PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS
OSHA
TWA - 5 mg/m³ (RESPIRABLE DUST FRACTION)

BIOLOGICAL EXPOSURE INDEX
NOT AVAILABLE
KOREAN OCCUPATION OF SAFETY AND HEALTH REGULATION

NOT AVAILABLE

APPROPRIATE ENGINEERING CONTROLS

PROVIDE LOCAL EXHAUST VENTILATION SYSTEM OR OTHER ENGINEERING CONTROLS TO KEEP THE AIRBORNE CONCENTRATIONS OF VAPOR BELOW THEIR RESPECTIVE THRESHOLD LIMIT VALUE. CHECK LEGAL SUITABILITY OF EXPOSURE LEVEL.

PERSONAL PROTECTIVE EQUIPMENT

RESPIRATOR

WEAR NIOSH OR EUROPEAN STANDARD EN 149 APPROVED FULL OR HALF FACE PIECE(WITH GOGGLES) RESPIRATORY PROTECTIVE EQUIPMENT WHEN NECESSARY.

AIR RESPIRATOR ARE REQUIRED IN CASE OF HIGH FREQUENCY USE OR SEVERE EXPOSURE.

AIR-PURIFYING RESPIRATOR(HIGH EFFICIENCY PARTIFULATE ABSORBER) IN CASE OF UNKNOWN CONCENTRATIONS OR URGENT RISK OF LIFE/HEALTH.

AIR-LINE MASK(COMBINATION AIRLINE BREATHING MASK) AIR-BREATHING APPARAUASE(FULL FACEPIECE)

EYE PROTECTION

WEAR SAFETY GLASSES(GOGGLES) TO PROTECT EYES FROM DUST.

HAND PROTECTION

WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT EXPOSURE OF SKIN.

BODY PROTECTION

WEAR APPROPRIATE PROTECTIVE CLOTHING TO PREVENT EXPOSURE OF SKIN.

SECTION 9 : PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

STATE
SOLID

COLOR
YELLOW

ODOR
PETROCHEMICAL ODOR

ODOR THRESHOLD
NOT AVAILABLE

Ph
NOT AVAILABLE

MELTING POINT/FREEZING POINT
94~102℃(SOFTENING POINT)

INITIAL BOILING POINT AND BOILING RANGE
NOT AVAILABLE

FLASH POINT
>270℃

EVAPORATION RATE
NOT APPLICABLE
FLAMMABILITY(SOLID, GAS)
NOT AVAILABLE
UPPER/LOWER FLAMMABILITY OR EXPLOSIVE LIMITS
NOT AVAILABLE
(DUST EXPLSIVENESS : MINIMUM COMPLEXING ENGERGY(M.I.E TEST) < 3mJ)
VAPOR PRESSURE
NOT APPLICABLE
SOLUBILITY(ies)
INSOLUBLE
VAPOR DENSITY
NOT APPLICABLE
SPECIFIC GRAVITY
0.96~1.00
PARTITION COEFFICIENT(n-OCTANOL/WATER)
NOT APPLICABLE
AUTO IGNITION TEMPERATURE
NOT AVAILABLE
DECOMPOSITION TEMPERATURE
NOT AVAILABLE
VISCOSITY
140 cps(200℃)
MOLECULAR WEIGHT
APPROX. 1900(Mw)

SECTION 10 : STABILITY AND REACTIVITY

CHEMICAL STABILITY AND POSSIBILITY OF HAZARDOUS REACTIONS
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.
IT WILL NOT OCCUR POLYMERIZATION REACTION.
CONDITION TO AVOID
AVOID HEAT, FLAMES, SPARKS AND OTHER SOURCES OF IGNITION.
INCOMPATIBLE MATERIALS
STRONG OXIDIZING AGENT
HAZARDOUS DECOMPOSITION PRODUCTS
CARBON OXIDES, NITROGEN OXIDES

SECTION 11 : TOXICOLOGICAL INFORMATION

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE
VAPOR BY POLYMERIZATION OR DECOMPOSITION MAY CAUSE IRRATATION
OF EYES, SKIN, THROAT AND LUNG.
INFORMATION OF HEALTH HAZARDOUS
ACUTE TOXICITY
ORAL : NOT CLASSIFIED ATEmix = 6,994mg/kg
(PETROLEUM HYDROCARBON RESIN : LD₅₀ = 7,000mg/kg(MAMMAL))
(ANTIOXIDANT : LD₅₀>5,000mg/kg(RAT))
DERMAL: NOT CLASSIFIED
(99.8% OF THIS PRODUCT CONSIST OF INGREDIENTS OF UNKNOWN TOXICITY)
(PETROLEUM HYDROCARBON RESIN: NOT AVAILABLE)
(ANTIOXIDANT: LD$_{50}$$>3,160$mg/kg (RABBIT))

INHALATION (DUST/MIST): NOT CLASSIFIED
(99.8% OF THIS PRODUCT CONSIST OF INGREDIENTS OF UNKNOWN TOXICITY)
(PETROLEUM HYDROCARBON RESIN: NOT AVAILABLE)
(ANTIOXIDANT: LC$_{50}$(4hr)$>46$mg/l (RABBIT))

SKIN CORROSION/IRRITATION
NOT CLASSIFIED
(0.2% OF THIS PRODUCT CONSIST OF INGREDIENTS OF UNKNOWN TOXICITY)
(PETROLEUM HYDROCARBON RESIN: NOT CLASSIFIED)
SKIN IRRITATION TEST: NOT IRITATIVEW BASED ON PRIMARY IRITATION
INDEX = 0
(ANTIOXIDANT: NOT AVAILABLE)

SERIOUS EYE DAMAGE/IRRITATION
NOT CLASSIFIED
(99.8% OF THIS PRODUCT CONSIST OF INGREDIENTS OF UNKNOWN TOXICITY)
(PETROLEUM HYDROCARBON RESIN: NOT AVAILABLE)
(ANTIOXIDANT: IN TEST ON EYE IRRITATION WITH RABBITS,
MILD IRRITATION WAS OBSERVERD.)

RESPIRATORY SENSITIZER
NOT AVAILABLE

SKIN SENSITIZATION
NOT CLASSIFIED
(99.8% OF THIS PRODUCT CONSIST OF INGREDIENTS OF UNKNOWN TOXICITY)
(PETROLEUM HYDROCARBON RESIN: NOT AVAILABLE)
(ANTIOXIDANT: THE MAXIMIZATION TEST USING GUINEA PIGS RESULTED IN
NEGATIVE.)

CARCINOGENICITY
NOT AVAILABLE
IARC: NOT AVAILABLE
OSHA: NOT AVAILABLE
WISHA: NOT AVAILABLE
ACGIH: NOT AVAILABLE

MUTAGENICITY
NOT AVAILABLE

REPRODUCTIVE TOXICITY
NOT CLASSIFIED
(99.8% OF THIS PRODUCT CONSIST OF INGREDIENTS OF UNKNOWN TOXICITY)
(PETROLEUM HYDROCARBON RESIN: NOT AVAILABLE)
(ANTIOXIDANT: IN F2 REPRODUCTIVE TOXICITY TEST WITH RATS FOR
10 MONTHS (DOSE: 0, 1000, 3000, 10000 ppm), NOAEL WERE 10,000 ppm.(GLP))

SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE)
NOT AVAILABLE
SPECIFIC TARGET ORGAN TOXICITY (REPEAT EXPOSURE)

NOT CLASSIFIED

(99.8% OF THIS PRODUCT CONSIST OF INGREDIENTS OF UNKNOWN TOXICITY)

(PETROLEUM HYDROCARBON RESIN : NOT AVAILABLE)

(ANTIOXIDANT : NOAEL=10,000ppm (250mg/kg dw/day). WHEN BEAGLES WERE EXPOSED REPEATEDLY AT DOSES OF 0, 1000, 3000 AND 10000 ppm FOR 90 DAYS, ANY TOXIC EFFECTS WERE NOT OBSERVED AT THE HIGHEST DOSE OF 10000 ppm (1,500mg/kg bw/day)

ASPIRATION HAZARD

NOT AVAILABLE

SECTION 12 : ECOLOGICAL INFORMATION

ECOLOGICAL TOXICITY

FISH

NOT CLASSIFIED

(99.8% OF THIS PRODUCT CONSIST OF INGREDIENTS OF UNKNOWN TOXICITY)

(PETROLEUM HYDROCARBON RESIN : NOT AVAILABLE)

(ANTIOXIDANT : 96hr LC$_{50}$>100mg/l (BRACHYDANIO RERIO) (OECD TG 203, GLP))

CRUSTACEA

NOT CLASSIFIED

(99.8% OF THIS PRODUCT CONSIST OF INGREDIENTS OF UNKNOWN TOXICITY)

(PETROLEUM HYDROCARBON RESIN : NOT AVAILABLE)

(ANTIOXIDANT : 24hr LC$_{50}$>86mg/l (DAPHNIA MAGNA) (OECD TG 202, GLP))

ALGAE

NOT CLASSIFIED

(99.8% OF THIS PRODUCT CONSIST OF INGREDIENTS OF UNKNOWN TOXICITY)

(PETROLEUM HYDROCARBON RESIN : NOT AVAILABLE)

(ANTIOXIDANT : 72hr EC$_{50}$>100mg/l (SCENDESMUS SUBSPICATUS) (DIRECTIVE 87/302/EEC, GLP))

PERSISTENCE AND DEGRADABILITY

PERSISTENCE

NOT READILY DEGRADABLE. AND THERE WERE PERSISTENCE POSSIBLITY WITH INSOLUBLE.

(PETROLEUM HYDROCARBON RESIN : NOT AVAILABLE)

(ANTIOXIDANT : log Kow=23(25℃) (DIRECTIVE 84/449/EEC, A6, GLP))

DEGRADABILITY

NOT AVAILABLE

BIOACCUMULATIVE POTENTIAL

BIOACCUMULATION

NOT AVAILABLE

(99.8% OF THIS PRODUCT CONSIST OF INGREDIENTS OF UNKNOWN TOXICITY)

(PETROLEUM HYDROCARBON RESIN : NOT AVAILABLE)

(ANTIOXIDANT : BIOACCUMULATIVE POTENTIAL IS LOW AS A BIOCONCENTRATION FACTOR AT 0.1mg/l BASED ON THE BIOACCUMULATIVE TEST USING CARP (CYPRINUS CARPIO) (BCF<2.3))
BIODEGRADATION
NON-BIODEGRADABLE
(99.8% OF THIS PRODUCT CONSIST OF INGREDIENTS OF UNKNOWN TOXICITY)
(ANTIOXIDANT : DEGRADED 0% IN THE BIODEGRADATION TEST FOR 4 WEEKS.
(OECD TG031C))

MOBILITY IN SOIL
NOT AVAILABLE

OTHER HAZARD EFFECTS
NOT AVAILABLE

SECTION 13 : DISPOSAL CONSIDERATIONS

DISPOSAL METHOD
WASTE MUST BE DISPOSED OF IN ACCORDANCE WITH FEDERAL, STATE
AND LOCAL ENVIRONMENTAL CONTROL REGULATIONS.

DISPOSAL PRECAUTION
CONSIDER THE REQUIRE ATTENTIONS IN ACCORDANCE WITH WASTE
TREATMENT MANAGEMENT REGULATION.

SECTION 14 : TRANSPORT INFORMATION

UN NUMBER
NOT APPLICABLE

UN PROPER SHIPPING NAME
NOT APPLICABLE

TRANSPORT HAZARD CLASS
NOT APPLICABLE

PACING GROUP
NOT APPLICABLE

MARINE POLLUTANT
NOT APPLICABLE

INFORMATION NOTE
IN CASE OF FIRE
NOT APPLICABLE

IN CASE OF LEAKAGE
NOT APPLICABLE

SECTION 15 : REGULATORY INFORMATION

EU CLASSIFICATION
CLASSIFICATION
NOT AVAILABLE

RISK PHRASES
NOT AVAILABLE

SAFETY PHRASES
NOT AVAILABLE
EU RoHS REGULATION (DIRECTIVE 2002/96/EC)
The four heavy metals and brominated flame retardants were not detected.

U.S.A MANAGEMENT INFORMATION
OSHA (29CFR1910.119) NOT REGULATED
CERCLA 103 (40CFR302.4) NOT REGULATED
EPCRA 302 (40CFR355.3) NOT REGULATED
EPCRA 304 (40CFR355.4) NOT REGULATED
EPCRA 313 (40CFR372.65) NOT REGULATED

SARA CLASSIFICATION
SARA HAZARD CATEGORIES, SARA SECTIONS 311/312 (40CFR370.21) : NONE
SARA SECTION 313 (40CFR372.65) : NONE

SUBSTANCE OF RoterDAME PROTOCOL
NOT REGULATED

SUBSTANCE OF STOCKHOLME PROTOCOL
NOT REGULATED

SUBSTANCE OF MONTREAL PROTOCOL
NOT REGULATED

INVENTORY STATUS
TSCA (US TOXIC SUBSTANCES CONTROL ACT) : ALL COMPONENTS OF THIS PRODUCT ARE LISTED ON THE TSCA INVENTORY.
DSL (CANADIAN DOMESTIC SUBSTANCES LIST) : ALL COMPONENTS OF THIS PRODUCT ARE LISTED ON THE DSL INVENTORY.
EINECS (EUROPEAN INVENTORY OF EXISTING COMMERCIAL CHEMICAL SUBSTANCES) : THIS PRODUCT IS LISTED ON EINECS OR OTHERWISE COMPLIES WITH EINECS REQUIREMENTS.
AICS/NICNAS (AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES AND NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME) : ALL COMPONENTS OF THIS PRODUCT ARE LISTED ON THE AICS OR OTHERWISE COMPLY WITH NICNAS INVENTORY.
MITI (JAPANESE HANDBOOK OF EXISTING AND NEW CHEMICAL SUBSTANCES) : ALL COMPONENTS OF THIS PRODUCT ARE LISTED ON THE MITI INVENTORY.
KECI (KOREAN EXISTING CHEMICAL AND CHEMICAL SUBSTANCES) : ALL COMPONENTS OF THIS PRODUCT ARE LISTED ON THE KECI INVENTORY.
PICCS (PHILIPPINES INVENTORY OF CHEMICAL AND CHEMICAL SUBSTANCES) : ALL COMPONENTS OF THIS PRODUCT ARE LISTED ON THE PICCS INVENTORY.
IECSC (INVENTORY OF CHEMICAL SUBSTANCES MANUFACTURED OR IMPORTED IN CHINA) : ALL COMPONENTS OF THIS PRODUCT ARE LISTED ON THE IECSC INVENTORY.

SECTION 16 : OTHER INFORMATION
INFORMATION SOURCE AND REFERENCES

KOREA OCCUPATIONAL HEALTH&SAFETY AGENCY (MSDS) (HTTP://WWW.KOSHA.NET)
The product analysis conducted by Research Institute of Kolon Industries, Inc. (CHEMICAL)
KOREA TESTING AND RESEARCH INSTITUTE FOR CHEMICAL INDUSTRY SKIN
IRRITATION TEST DATA (TBH-000718 (2003), TEST METHOD: THE NOTICE 1999-6
OF KOREA FOOD AND DRUG ADMINISTRATION
KOREA TESTING AND RESEARCH INSTITUTE FOR CHEMICAL INDUSTRY HAZARDOUS CHEMICAL SUBSTANCE ANALYSIS DATA
M.I.E TEST REPORT OF CHILWORTH IN USA
THE MSDS DATA PUBLISHED BY ANTIOXIDANT MANUFACTURER
CHEMICAL RISK INFORMATION PLATFORM (CHRIP) (HTTP://WWW.SAFE.NITE.GO.JP/ENGLISH/DB.HTML)
QUANTITATIVE STRUCTURE ACTIVITY RELATION (QSAR)
INTERNATIONAL UNIFORM CHEMICAL INFORMATION DATABASE (IUCLID)
(HTTP://ECB.JRC.IT/ESIS)

ISSUING DATE
07 AUGUST 1996

REVISION NUMBER AND DATE

REVISION NUMBER
11TH

DATE OF THE LASTEST REVISION
1 JANUARY 2015

REASON FOR REVISION
CLASSIFICATION AND LABELLING OF CHEMICALS FOLLOWING GHS AND FOLLOWING THE NOTICE ABOUT PREPARING OF A MATERIAL SAFETY DATA SHEET.

PREPARED BY
G.D.KIM. MANAGER OF TECHNICAL TEAM,
ULSAN PLANT, KOLON INDUSTRIES

THE INFORMATION CONTAINED HEREIN IS TO THE BEST OF OUR KNOWLEDGE AND BELIEF ACCURATE. SINCE MSDS IS TO PROVIDE INFORMATION ON THE HEALTH/SAFETY/ENVIRONMENT TO USERS OF THE SUBSTANCE, DATA WRITTEN HERE DO NOT MEAN TO ENSURE PROPERTIES OF MATTER OR SPEC.