

1. IDENTIFICATION

A. PRODUCT NAME

- HFA 451

B. Recommended Use and Restriction on Use

- General use : Not available
- Restriction on Use : Not applicable

C. Information of Manufacturer

– Manufacturer

- Company name : Korea Kumho Petrochemical Co., Ltd.
- Address : 260-257, Cheoyong-ro, Nam-Gu, Ulsan, 44785, Korea
- Dept. : Quality Assurance Team
- Person in charge :
- Telephone number : +82-52-279-8852
- Fax number : +82-52-279-8840
- Emergency :

– Supplier / distributor

- Company name :
- Address :
- Dept. :
- Person in charge :
- Telephone number :
- Fax number :
- Emergency :

2. HAZARD IDENTIFICATION

A. GHS Classification :

- Acute inhalation toxicity : Category 4
- Carcinogenicity : Category 1B
- Reproductive toxicity : Category 1B
- Specific target organ toxicity (Single exposure) : Category 1(heart)
Category 2(Respiratory)

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- Specific target organ toxicity (Repeated exposure) : Category 1 (Respiratory)
- Chronic aquatic toxicity : Category 3

B. GHS label elements

- Hazard symbols :



- Signal word : Danger

- Hazard statement :

- H332 Harmful if inhaled
- H350 May cause cancer
- H360 May damage fertility or the unborn child
- H370 Causes damage to organs
- H371 May cause damage to organs
- H372 Causes damage to organs through prolonged or repeated exposure.
- H412 Harmful to aquatic life with long lasting effects

- Precautionary statements :

- Prevention
 - P201 Obtain special instructions before use.
 - P202 Do not handle until all safety precautions have been read and understood.
 - P260 Do not breathe dust/fume/gas/mist/vapours/spray.
 - P261 Avoid breathing dust/fume/gas/mist/vapours/spray.
 - P264 Wash thoroughly after handling.
 - P270 Do not eat, drink or smoke when using this product.
 - P271 Use only outdoors or in a well-ventilated area.
 - P273 Avoid release to the environment.
 - P281 Use personal protective equipment as required.
- Response
 - P304+P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

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- P307+P311 IF exposed: Call a POISON CENTER or doctor/physician.
- P308+P313 IF exposed or concerned: Get medical advice/attention.
- P309+P311 IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician.
- P312 Call a POISON CENTER or doctor/physician you feel unwell.
- P314 Get medical advice/attention if you feel unwell.
- P321 Specific treatment (see ... on this label).
- Storage
 - P405 Store locked up.
- Disposal
 - P501 Dispose of contents/container in accordance with local/regional/national/international regulation.

C. Other hazards which do not result in classification :

- NFPA rating: (0~4 steps) : Health=3, Flammability=0, Reactivity=0

3. COMPOSITION/INFORMATION ON INGREDIENTS

| Chemical name | CAS No./ECL No./EINECS No. | Contents(%) |
|--------------------------|------------------------------|-------------|
| ABS Resin | 9003-56-9/KE-29398/- | 50~70 |
| Tetra Bromo Bisphenol A | 79-94-7/KE-23971/201-236-9 | 5~30 |
| Chlorinated Polyethylene | 64754-90-1/KE-05477/- | 5~20 |
| Antimony Trioxide | 1309-64-4/KE-09846/215-175-0 | 1~20 |
| Antioxidant | 2082-79-3/KE-03070/218-216-0 | 0.1~10 |
| Wax | 110-30-5/KE-13662/203-755-6 | 0.1~5 |

※ Reference No. : ECL(Registration number of Korean Existing Chemical List)
EINECS(Registration number of Europe Existing Chemical List)

4. FIRST-AID MEASURES

A. Eye Contact :

- Immediately flush eyes with plenty of water at least 15minutes.
- If irritation persists, get a doctor's examination.
- Lifting eyelids occasionally to wash eyelids down enough to follow up.

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B. Skin Contact :

- Wash the contaminated skin area with running water.
- Cooling the contaminated skin with cool running water when contact with melt.
- Get medical attention when burn by melt.

C. Inhalation :

- Remove exposed person to fresh air.
- Remove victim to fresh air and keep at rest in a position comfortable.
- Intake the water to clean the throat and blow nose to remove the dust.
- Get medical attention.

D. Ingestion :

- Rinse mouth with water.
- Give large amounts of water to relieve stimulus.
- Toxic by ingestion does not high.
- If irritation or symptoms occurs, get a doctor's examination.

E. Delay and immediate effects and also chronic effects from short and long term exposure : Not available

F. Notice to Physician :

- Treatment may vary with condition of victim and specifics of incident.

5. FIRE FIGHTING MEASURE

A. Suitable (Unsuitable) extinguishing media :

- Extinguishing media : Powder foam, carbon dioxide, foam.
- Unsuitable Extinguishing media : Do not use direct water.
- Big Fire : Water spray, regular foam

B. Specific hazards arising from the chemical

- Combustion :
 - Generate hydrogen cyanide, halogenated compounds, carbon oxides occurs when fire.

- Levels of fire hazard :
 - Dust / air mixtures may ignite or explode.

C. Fire fighting procedures and equipments :

- Wear appropriate personal protective equipment(see section 8. EXPOSURE CONTROLS/PERSONAL PROTECTION).
- Avoid inhalation of smoke or gas when fire fighting.
- Move container from fire area if it can be done without risk.
- Cool containers with water until well after fire is out.

6. ACCIDENTAL RELEASE MEASURES

A. Personal Precautions, Protective Equipment and Emergency procedures :

- Perform in accordance with 「 See section 8. EXPOSURE CONTROLS / PERSONAL PROTECTION」 . Put on appropriate personal protective equipment.
- Where possible allow leak of molten material to solidify mechanical and chemical protective.
- Use a way to minimize dust.
- Avoid contact with eyes and skin.
- Avoid inhalation of substance itself or combustion.
- Evacuation against the wind.
- Avoid contact with heat, sparks, flame or other ignition sources.

B. Environmental Precautions

- Avoid dispersal of spilt material and runoff and contact with waterways, drains and sewers. If large spills, advise emergency services.

C. Methods and materials for containment and cleaning up :

- For small spills.
 - Remove all sources of ignition.
 - Suppression occurrence of dust.
 - Appropriate container for disposal of spilled material collected.
 - Ventilate leak areas and clearing leak area.
- For large spills.
 - Remove all sources of ignition.

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- Suppression occurrence of dust.
- Avoid entering to sewers or water system.
- For disposal of spilled material in appropriate containers collected and clear surface.
- Appropriate container for disposal of spilled material collected.

7. HANDLING AND STORAGE

A. Handling :

- Perform in accordance with 「 See section 8. EXPOSURE CONTROLS / PERSONAL PROTECTION」 . Put on appropriate personal protective equipment.
- Handle in a well-ventilated place.
- Avoid contact with heat, sparks, flame or other ignition sources.
- Remove all sources of ignition.
- Use all the equipment after the ground.
- Wash thoroughly after handling.

B. Storage Precautionary Statements :

- Keep in original container and tightly closed.
- Avoid contact moisture.
- Avoid contact with incompatible materials.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

A. Exposure limit

- Exposure limit under ISHL :
 - ABS Resin : Not available
 - Tetra Bromo Bisphenol A : Not available
 - Chlorinated Polyethylene : Not available
 - Antimony Trioxide : TWA 0.5 mg/m³
 - Antioxidant : Not available
 - Wax : Not available
- ACGIH :
 - ABS Resin : Not available
 - Tetra Bromo Bisphenol A : Not available

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- Chlorinated Polyethylene : Not available
- Antimony Trioxide : Maintain exposure levels as low as possible
- Antioxidant : Not available
- Wax : Not available
- Biological exposure limits : Not applicable

B. Engineering Controls

- A system of local and/or general exhaust is recommended to keep employee exposures above the Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. The use of local exhaust ventilation is recommended to control emissions near the source.

C. Personal Protective Equipment :

- Respiratory Protection : Use the respirator be given official approval by Korea Occupational Safety & Health Agency. Under conditions of frequent use or heavy exposure, Respiratory protection may be needed. Respiratory protection is ranked in order from minimum to maximum. Consider warning properties before use.
 - Dust, mist, fume–purifying respiratory protection
 - Any air–purifying respirator with a corpuscle filter of high efficiency
 - Any respiratory protection with a electromotion fan(for dust, mist, fume–purifying)
 - ※ For Unknown Concentration or Immediately Dangerous to Life or Health
 - Self–contained breathing apparatus(pressure–demand or other positive–pressure mode in combination)
 - Supplied–air respirator with full facepiece
- Eye Protection : Wear primary eye protection such as splash resistant safety goggles with a secondary protection faceshield. Provide an emergency eye wash station and quick drench shower in the immediate work area.
- Hand Protection : Wear heat resistant protected gloves to withstand the temperature of molten product.
- Body Protection : Wear chemical resistant protected clothing if there is hazard potential for direct contact.

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9. PHYSICAL AND CHEMICAL PROPERTIES

- A. Appearance : Pellet
- B. Odor : Odorless
- C. Odor threshold : Not available
- D. pH : Not available
- E. Melting point/Freezing point : Not applicable
- F. Initial Boiling Point/Boiling Ranges : Not applicable
- G. Flash point : 350 °C
- H. Evapourating Rate : Not available
- I. Flammability(solid, gas) : Not available
- J. Upper/Lower Flammability or explosive limits : Not available
- K. Vapour pressure : Not applicable
- L. Solubility : Insoluble
- M. Vapour density(Air=1) : Not applicable
- N. Relative density : 1.15~1.18
- O. Partition coefficient of n-octanol/water : Not available
- P. Autoignition Temperature : Not applicable
- Q. Decomposition Temperature : Not applicable
- R. Viscosity : 150~170 °C
- S. Molecular weight : Not available

10. STABILITY AND REACTIVITY

- A. Stability
 - This material is stable under recommended storage and handling conditions
- B. Possibility of Hazardous Reaction
 - Will not occur.
- C. Conditions to Avoid
 - Avoid contact with heat, sparks, flame or other ignition sources of ignition.
- D. Materials to Avoid
 - Strong oxidizing agents.

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E. Hazardous Decomposition Products

- Generate hydrogen cyanide, halogenated compounds, carbon oxides.

11. TOXICOLOGICAL INFORMATION

A. Information on the likely routes of exposure

- (Respiratory tracts) : Harmful if inhaled
Airway irritation
Prolonged or repeated exposure to suspected
Pneumonia.
- (Oral) : Other category
- (Eye · Skin) : Other category

B. Delayed and immediate effects and also chronic effects from short and long term exposure

- Acute toxicity :
 - Acute oral toxicity
 - ABS Resin : Not available
 - Tetra Bromo Bisphenol A : LD50(rat) > 5000 mg/kg
 - Chlorinated Polyethylene : LD50(rat) > 5000 mg/kg
 - Antimony Trioxide : LD50(rat) 34600 mg/kg
 - Antioxidant : LD50(rat) > 2000 mg/kg
 - Wax : LD50(rat) > 5000 mg/kg
 - Acute dermal toxicity :
 - ABS Resin : Not available
 - Tetra Bromo Bisphenol A : LD50(rabbit) > 2000 mg/kg
 - Chlorinated Polyethylene : Not available
 - Antimony Trioxide : Not available
 - Antioxidant : LD50(rat) > 2000 mg/kg
 - Wax : LD50(rabbit) > 2000 mg/kg
 - Acute Inhalation toxicity :
 - ABS Resin : Not available
 - Tetra Bromo Bisphenol A : LC50(rat) > 1 mg/l/4hr
 - Chlorinated Polyethylene : Not available
 - Antimony Trioxide : Not available

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- Antioxidant : LC50(rat) > 1.8 mg/l/4hr
- Wax : Not available
- Skin corrosion/irritation :
 - ABS Resin : Not available
 - Tetra Bromo Bisphenol A : Not irritating
 - Chlorinated Polyethylene : Not available
 - Antimony Trioxide : Mild irritating
 - Antioxidant : Mild irritant (Rabbits recovered within 7 days)
 - Wax : Mild skin irritation
- Serious eye damage/irritation :
 - ABS Resin : Not available
 - Tetra Bromo Bisphenol A : Not irritating
 - Chlorinated Polyethylene : Not available
 - Antimony Trioxide : Rabbit eye irritation test results – mild irritant
 - Antioxidant : Not irritating
 - Wax : Mild eye irritation
- Respiratory sensitization :
 - ABS Resin : Not available
 - Tetra Bromo Bisphenol A : No sensitization
 - Chlorinated Polyethylene : Not available
 - Antimony Trioxide : Not available
 - Antioxidant : Not available
 - Wax : Not available
- Skin sensitization :
 - ABS Resin : Not available
 - Tetra Bromo Bisphenol A : No sensitization
 - Chlorinated Polyethylene : Not available
 - Antimony Trioxide : Not available
 - Antioxidant : Guinea Pig – No sensitization (3 week 3 times)
 - Wax : Not available
- Carcinogenicity :
 - ABS Resin : Not available
 - Tetra Bromo Bisphenol A : Not available
 - Chlorinated Polyethylene : Not available
 - Antimony Trioxide : ACGIH – A2, IARC – Group 2B, EU CLP – Carc.2

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- Antioxidant : Not available
- Wax : Not available
- Germ cell mutagenicity :
 - ABS Resin : Not available
 - Tetra Bromo Bisphenol A : Ames test – Negative
 - Chlorinated Polyethylene : Not available
 - Antimony Trioxide : Chromosomal aberration test results – Negative
 - Antioxidant : Ames test – Negative
 - Chromosomal aberration test results – Negative
 - Availability of metabolic activation system – Negative
 - Wax : Ames test – Negative
- Reproductive toxicity :
 - ABS Resin : Not available
 - Tetra Bromo Bisphenol A : In the second generation test rats 10, 100, 1000 mg/kg, modify, or reproductive effects when exposed to no. No maternal toxicity, impact on developmental toxicity were observed. Fetal viability, absorption, implantation, or no change in progesterone.
 - Chlorinated Polyethylene : Not available
 - Antimony Trioxide : Deformities, and reproductive toxicity studies in rats in the test is not pregnant. Before and after implantation of the increased absorption appears.
 - Antioxidant : Second-generation reproductive toxicity test (rats)
 - NOAEL 315mg/kgbw/day
 - Wax : Not available
- Specific target organ toxicity(single exposure) :
 - ABS Resin : Not available
 - Tetra Bromo Bisphenol A : Irritating by inhalation
 - Chlorinated Polyethylene : Not available
 - Antimony Trioxide : Causalgia, colic, vomiting visible in human.
Discoloration of the lungs weakly localized in animals.
 - Antioxidant : Not available
 - Wax : Not available
- Specific target organ toxicity(repeated exposure) :
 - ABS Resin : Not available
 - Tetra Bromo Bisphenol A : No toxic effects

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- Chlorinated Polyethylene : Not available
- Antimony Trioxide : Pneumonia and pneumoconiosis in human
- Antioxidant : Not available
- Wax : Not available
- Aspiration hazard : Not available

12. ECOLOGICAL INFORMATION

A. Ecotoxicity :

- Acute aquatic toxicity
 - Fish :
 - ABS Resin : Not available
 - Tetra Bromo Bisphenol A : LC50 0.54 mg/l/96hr, *Pimephales promelas*
 - Chlorinated Polyethylene : Not available
 - Antimony Trioxide : LC50 80 mg/l/96hr
 - Antioxidant : LC50 19.2 mg/l/96hr
 - Wax : LC>1.5 mg/l/96hr *Oryzias latipes*
 - Invertebrate :
 - ABS Resin : Not available
 - Tetra Bromo Bisphenol A : EC50 0.96 mg/l/48hr, *Daphnia magna*
 - Chlorinated Polyethylene : Not available
 - Antimony Trioxide : EC50 423.45 mg/l/48hr
 - Antioxidant : EC50 13.9 mg/l *Daphnia magna*
 - Wax : EC50>1.6 mg/l/48hr *Daphnia magna*
 - Algae :
 - ABS Resin : Not available
 - Tetra Bromo Bisphenol A :
EC50 0.09 ~ 0.89 mg/l/96hr, *Selenastrum capricornutum*
 - Chlorinated Polyethylene : Not available
 - Antimony Trioxide : Not available
 - Antioxidant : EC50 > 30 mg/l/72hr, *Scenedesmus subspicatus*
 - Wax : EC50>1.6 mg/l/48hr, *Scenedesmus subspicatus*

B. Persistence and degradability

Persistence :

- ABS Resin : Not available
- Tetra Bromo Bisphenol A : log Kow = 4.54
- Chlorinated Polyethylene : Not available
- Antimony Trioxide : Not available
- Antioxidant : log Kow = 13.41 (calculated)
- Wax : Not available

Degradability : Not available

C. Bioaccumulative potential

Bioaccumulation :

- ABS Resin : Not available
- Tetra Bromo Bisphenol A : BCF = 20
- Chlorinated Polyethylene : Not available
- Antimony Trioxide : Not available
- Antioxidant : BCF ≤ 12
- Wax : 자료없음

Biodegradability :

- ABS Resin : Not available
- Tetra Bromo Bisphenol A : 0 (%) 14 day
- Chlorinated Polyethylene : Not available
- Antimony Trioxide : Not available
- Antioxidant : 21 ~ 39 (%) 28 day
- Wax : 15 (%) 28 day

D. Mobility in soil : Not available

E. Other adverse effects : Classified as category 2 according to the toxic chemical under TCCA Article 2.3

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13. DISPOSAL CONSIDERATION

A. Disposal methods

- The user of this product must properly characterize the waste/container generated from the use of this product in accordance with all applicable federal, state and/or local laws and regulations in order to determine the proper disposal of the waste in accordance with all applicable federal, state and/or local laws and regulations.

B. Special precautions for disposal :

- The user of this product must disposal by oneself or entrust to waste disposer or person who other' s waste recycle and dispose, person who establish and operate waste disposal facilities.
- Dispose of waste in accordance with local regulation.

14. TRANSPORT INFORMATION

A. UN number : Not regulated for transport of dangerous goods

B. Proper shipping name : Not applicable

C. Hazard class : Not applicable

D. Packing group : Not applicable

E. Marine pollutant : Not applicable

F. Special precautions for user related to transport or transportation measures :

- 1) EmS FIRE SCHEDULE : Not available
- 2) EmS SPILLAGE SCHEDULE : Not available

G. IATA Transport : Not Classified as dangerous for IATA Transport

15. REGULATORY INFORMATION

A. Korea Industry Safety and Health Law (ISHL) :

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- This product is subject to the chemical for classification and labeling under ISHL Article 41.
- This product is Working Environment Measurement materials under ISHL Article 42.
 - Antimony Trioxide[1309-64-4] which contains one of above materials over 1% by volume.
- This product is Material exposure standard under ISHL Article 39 [Labor notice 2011-13]
 - Antimony Trioxide[1309-64-4] which contains one of above materials over 1% by volume.
- This product is Managed hazardous substances under ISHL rule 42 [Article 420, 439, 440 Related Appendix 12]
 - Antimony Trioxide[1309-64-4] which contains one of above materials over 1% by volume.
- This product is Working Special health materials under ISHL Article 42.
 - Antimony Trioxide[1309-64-4] which contains one of above materials over 1% by volume.

B. The Toxic Chemical Control Act in Korea(TCCA)

- Toxic Chemicals :
 - Antimony Trioxide[1309-64-4] which contains one of above materials over 1% by volume.
- Observational chemical : Not applicable
- Toxic Release Inventory(TRI) Chemicals : Applicable
 - Antimony Trioxide[1309-64-4] containing 0.1%, and 10 ton or more per year

C. Dangerous goods Safety Management Law in Korea : Not applicable

D. US regulations

- OSHA regulation (29CFR1910.119) : Not available
- CERCLA section 103 (40CFR302.4) : Applicable
 - Antimony Trioxide [1309-64-4] 453.599 kg 1000 lb
- EPCRA section 302(40CFR355.30) : Not available
- EPCRA section 304(40CFR355.40) : Not available

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- EPCRA section 313(40CFR372.65) : Applicable
 - Tetra Bromo Bisphenol A [79-94-7]

E. Other local or international regulation

- POPs Management Law : Not applicable
- Rotterdam Convention on Harmful Chemicals & Pesticides : Not applicable
- Stockholm Convention on Persistent Organic Pollutants : Not applicable
- Montreal Protocol on Substances That Deplete the Ozone Layer : Not applicable
- Information of EU Classification :
 - Tetra Bromo Bisphenol A
 - Classification : N; R50-53
 - Risk Phrases : R50-53
 - Safety Phrases : S60, S61
 - Antimony Trioxide
 - Classification : Carc. Cat. 3; R40
 - Risk Phrases : R40
 - Safety Phrases : S2 , S22, S36/37

16. OTHER INFORMATION

A. Reference

- This MSDS is prepared in accordance with ISHL Article 41 and MOL Notification No. 09-68 in Korea and consider the internal regulations by Korea Kumho Petrochemical Co., Ltd.

B. Issue date : 2010. 03. 03

C. Revision number and Last revised : 5th, 2018. 07. 19

D. Other information : Not available