

MATERIAL SAFETY DATA SHEET

FILE NO.: MSDS-201071 Ver. 1.0

MSDS DATE: 09/22/2011

E-Pure CyTOF Washing Solution



SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: E-Pure CyTOF™ Washing Solution, 250 mL

SYNONYMS: Fluorohydric acid; Fluoric acid; Hydrofluoric acid solution; HFA; Etching acid; Fluorohydric acid; Hydrogen fluoride in aqueous solution.

PRODUCT CODES: 201071

MANUFACTURER: DVS Sciences Inc.

DIVISION:

ADDRESS: 70 Esna Park Drive, Unit 12
Markham, ON L3R 6E7

TECHNICAL PHONE: (905) 513-1704

PRODUCT USE: For washing tubing of the CyTOF.

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

| <u>PRODUCT NAME</u> | <u>CAS NO.</u> | <u>%WT</u> | <u>%VOL.</u> |
|--|----------------|------------|--------------|
| E-Pure CyTOF Washing Solution | None | N/A | N/A |
| <u>DANGEROUS COMPONENTS</u> | | | |
| *Hydrofluoric Acid | 7664-39-3 | N/A | 0.05 |
| <u>CHEMICAL IDENTIFICATION OF THE SUBSTANCE/PREPARATION</u> | | | |
| Deionized Water (Gradient, >18MΩ) | 7732-18-5 | | ~99.95 |

SECTION 2 NOTES:

*Hydrofluoric Acid is present in the mixture at <1%. According to 29CFR1910.1200(d) ingredients at less than 1% concentration are not considered hazardous.

SECTION 3: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

Appearance: Danger! May be fatal if inhaled, absorbed through the skin or swallowed. Both liquid and vapor can cause severe burns to all parts of the body. Specialized medical treatment is required for any exposure to HF. Absorbed fluoride can cause metabolic imbalances with irregular heartbeat, nausea, dizziness, vomiting and seizures. Long-term exposure may cause bone and joint changes. Will attack glass and any silicon-containing material. Corrosive to metal. Before using this product, make sure that personal protective equipment and engineering controls are used and operating, and also that first aid treatments and procedures are available and understood.

Target Organs: Lungs, teeth, eyes, skin, bone, mucous membranes.

POTENTIAL HEALTH EFFECTS

Primary Routes of Entry: Skin contact. Eye contact. Inhalation and Ingestion.

Eyes: Contact with liquid or vapor causes severe burns and possible irreversible eye damage. Solutions as dilute as 2% or lower may cause burns.

Skin: May be fatal if absorbed through the skin. Causes severe burns with delayed tissue destruction. Substance is rapidly absorbed through the skin. Penetration may continue for several days. Causes severe tissue necrosis and bone destruction. Both liquid and vapor can cause severe burns, which may not be immediately painful or visible. Solutions as dilute as 2% or lower may cause burns. Systemic fluoride toxicity from exposure to hydrofluoric acid may result in severe hypocalcemia, hypomagnesemia, hyperkalemia, metabolic acidosis, cardiac dysrhythmias, and death. Burns caused by weak hydrofluoric acid may go unnoticed for several hours. Therefore, first aid procedures must be followed if any contact is suspected.

Ingestion: Causes severe digestive tract burns with abdominal pain, vomiting, and possible death. Human fatalities have been reported from acute poisoning. Systemic fluoride toxicity from exposure to hydrofluoric acid may result in severe hypocalcemia (depletion of calcium in the blood), hypomagnesemia, hyperkalemia, metabolic acidosis, cardiac dysrhythmias, and death.

Inhalation: May be fatal if inhaled. May cause severe irritation of the upper respiratory tract with pain, burns, and inflammation. May cause pulmonary edema and severe respiratory disturbances. Depletes calcium levels in the body which can lead to hypocalcemia and death. Concentrations of hydrofluoric acid above 40% fume in air.

Chronic Health Hazards: Chronic inhalation and ingestion may cause chronic fluoride poisoning (fluorosis) characterized by weight loss, weakness, anemia, brittle bones, and stiff joints. Repeated inhalation may cause chronic bronchitis. Chronic exposure to fluoride compounds may cause systemic toxicity. Skeletal effects may include bone brittleness, joint stiffness, teeth discoloration, tendon calcification, and osteosclerosis. Chronic ingestion or inhalation may cause weight loss, malaise, anemia, leukopenia (reduction in the number of white blood

MATERIAL SAFETY DATA SHEET

FILE NO.: MSDS-201071 Ver. 1.0

MSDS DATE: 09/22/2011

E-Pure CyTOF Washing Solution

cells in the blood), discoloration of the teeth and osteosclerosis (the hardening or abnormal density of bone). Repeated inhalation may cause osteofluorosis and permanent respiratory damage.

CARCINOGENICITY

OSHA: N/A

ACGIH: N/A

NTP: N/A

IARC: N/A

OTHER: N/A

SECTION 3 NOTES:

There are no relevant human or animal studies to assess the carcinogenicity of hydrofluoric acid. The International Agency for Research on Cancer (IARC) has not evaluated the carcinogenicity of hydrofluoric acid.

SECTION 4: FIRST AID MEASURES

EYES: Do NOT allow victim to rub eyes or keep eyes closed. Spills of HF should be flushed until medical attention arrives. **SPEEDY ACTION IS CRITICAL! GET MEDICAL ATTENTION IMMEDIATELY!** If a physician is not immediately available, apply one or two drops of 0.5% tetracaine hydrochloride solution followed by a second irrigation until medical attention arrives. Tetracaine hydrochloride will provide ocular anesthesia for 20 min. to an hour.

SKIN: Discard contaminated clothing in a manner which limits further exposure. Destroy contaminated shoes. Spills of HF should be flushed until medical attention arrives. **SPEEDY ACTION IS CRITICAL! GET MEDICAL ATTENTION IMMEDIATELY.** If available, after thorough washing (PREFERRED METHOD), a 2.5% calcium gluconate gel should be continuously massaged into the burned area, or the burned area should be immersed in a solution of 0.2% iced aqueous benzethonium chloride. Immersion may also be done with 0.13% iced aqueous Benzalkonium chloride. If immersion is not practical, towels should be soaked with one of the aforementioned solutions and used as compresses for the burned area. Ideally compresses should be changed every two minutes. It is suggested that a certain quantity of either prepared solution or the calcium gluconate be kept on hand at all times. These should be replaced annually if not previously used. Before using HF, make sure the solutions, gels and first aid attendant are available in case of exposure.

INGESTION: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately. **SPEED IS ESSENTIAL. A DOCTOR MUST BE NOTIFIED AT ONCE.**

INHALATION: **SPEEDY ACTION IS CRITICAL, OBTAIN MEDICAL AID IMMEDIATELY. POISON** material. If inhaled, get medical aid immediately. Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Calcium gluconate, 2.5% in normal saline may be given by nebulizer with oxygen.

NOTES TO PHYSICIANS OR FIRST AID PROVIDERS: Due to delayed and persistent symptoms, observe patient closely for 48 hours. Prompt action is essential in all cases of contact. Irrigate eyes with 1% calcium gluconate in normal saline for 1 to 2 hours to prevent or lessen corneal damage. For burns of large skin areas, for ingestion & inhalation exposure, severe systemic effects may occur. Monitor & correct for hypocalcemia, cardiac arrhythmias, hypomagnesemia & hyperkalemia. For inhalation exposures, treat as chemical pneumonia.

ANTIDOTE: Always have calcium gluconate gel on hand. The use of infiltration therapy and intra-arterial therapy for hydrofluoric acid burns resulting from concentrations greater than 20% should be made by qualified medical personnel. Calcium gluconate may be administered intravenously slowly to bind to the fluoride ion. This administration needs to be monitored under the supervision of a physician.

SECTION 5: FIRE-FIGHTING MEASURES

GENERAL INFORMATION: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Use water spray to keep fire-exposed containers cool. Reacts with most metals to form highly flammable hydrogen gas which can form explosive mixtures with air. Containers may explode in the heat of a fire. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products.

FLAMMABLE LIMITS IN AIR, UPPER: Not applicable.
(% BY VOLUME) LOWER:

FLASH POINT: Not applicable.

F:

C:

METHOD USED:

AUTOIGNITION TEMPERATURE: Not available.

F:

C:

NFPA HAZARD CLASSIFICATION

HEALTH: 4 FLAMMABILITY: 0 REACTIVITY: 1
OTHER:

MATERIAL SAFETY DATA SHEET

FILE NO.: MSDS-201071 Ver. 1.0

MSDS DATE: 09/22/2011

E-Pure CyTOF Washing Solution



HMIS HAZARD CLASSIFICATION

HEALTH: 3 FLAMMABILITY: 0 REACTIVITY: 1
PROTECTION: X

EXTINGUISHING MEDIA: Substance is noncombustible; use agent most appropriate to extinguish surrounding fire.

SPECIAL FIRE FIGHTING PROCEDURES: Wear self-contained breathing apparatus approved by NIOSH and full chemical protective clothing. Use water spray to keep containers cool.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Reactions with certain metals generates flammable and potentially explosive hydrogen gas. Considerable heat is evolved when contacted with many substances. Heat increases pressure and may explode container. Will react violently with water.

SECTION 6: ACCIDENTAL RELEASE MEASURES

GENERAL INFORMATION: Use proper personal protective equipment as indicated in Section 8.

SPILLS/LEAKS: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Provide ventilation. Evacuate unnecessary personnel. Approach spill from upwind. Remove ignition sources since flammable hydrogen gas may be generated by reactions with metals. Spills may produce white fumes of HF gas. Rapid dilution of the spill with water will reduce the amount of fumes given off. Carefully neutralize the dilute spill with lime slurry, soda ash, limestone, caustic soda or other alkaline material.

SECTION 7: HANDLING AND STORAGE

HANDLING: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Discard contaminated shoes. Use caution when opening. Do not breathe vapor or mist. Use only with adequate ventilation or respiratory protection. Do not put even dilute solutions of hydrofluoric acid in glass containers. Always add the acid to water, never the reverse. Never work alone with this chemical.

STORAGE: Store in a cool, dry, well-ventilated area away from incompatible substances. Corrosives area. Do not store in metal or glass containers. Inspect periodically for damage or evidence of leaks or corrosion. Store in approved containers only. Diking of storage containers is recommended.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use a corrosion-resistant ventilation system. If closed handling systems are not feasible, use local exhaust ventilation such as a fume hood (sash should not be glass). Keep the fume hood sash as low as possible.

RESPIRATORY PROTECTION: Wear a NIOSH/MSHA or European Standard EN 149 approved full-face piece airline respirator in the positive pressure mode with emergency escape provisions. Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

EYE PROTECTION: Wear chemical splash goggles and face shield.

SKIN PROTECTION: Wear butyl rubber gloves, apron, and/or clothing.

OTHER PROTECTIVE CLOTHING OR EQUIPMENT: Wear appropriate protective clothing to prevent skin exposure.

EXPOSURE LIMITS:

| <i>Chemical Name</i> | <i>OSHA – Final PELs</i> | <i>ACGIH</i> | <i>NIOSH</i> |
|----------------------|--------------------------|---|--|
| Hydrofluoric Acid | 3 ppm TWA | 0.5 ppm TWA (as F); 2 ppm Ceiling (as F) | 3 ppm TWA; 2.5 mg/m ³ TWA 30 ppm IDLH |

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Colourless

ODOR: No odor at this concentration.

PHYSICAL STATE: Liquid

pH AS SUPPLIED: Not available.

pH (Other): Not available.

MATERIAL SAFETY DATA SHEET

FILE NO.: MSDS-201071 Ver. 1.0

MSDS DATE: 09/22/2011

E-Pure CyTOF Washing Solution

BOILING POINT:

F:
C: 100°C

MELTING POINT:

F:
C: 0°C

FREEZING POINT:

F:
C: 0°C

VAPOR PRESSURE (mmHg): Not available.

@

F:
C:

VAPOR DENSITY (AIR = 1): Not available.

@

F:
C:

SPECIFIC GRAVITY (H2O = 1): Not available.

@

F:
C:

EVAPORATION RATE: Not available.

BASIS (=1): Not available.

SOLUBILITY IN WATER: Fully soluble.

PERCENT SOLIDS BY WEIGHT: Not available.

PERCENT VOLATILE:

BY WT/ BY VOL @

F:
C:

VOLATILE ORGANIC COMPOUNDS (VOC): Not available.

| | |
|-----------------------|----------------|
| WITH WATER: | LBS/GAL |
| WITHOUT WATER: | LBS/GAL |

MOLECULAR WEIGHT: Not available.

VISCOSITY: Not available.

@

F:
C:

SECTION 10: STABILITY AND REACTIVITY

STABILITY: Stable at room temperature in closed containers under normal storage and handling conditions. Hydrogen fluoride tends to associate by means of hydrogen bonds to form polymers in both the liquid and gaseous states, but this polymerization is not hazardous.

CONDITIONS TO AVOID (STABILITY): Excess heat, confined spaces.

INCOMPATIBILITY (MATERIAL TO AVOID): Metals, strong oxidizing agents, strong bases, acetic anhydride, alcohols, amines, Glass, concrete and other silicon-bearing materials will yield silicon tetrafluoride gas in contact with HFA. Pressure build up from this process has been known to blow up glass containers. Carbonates, sulfides, and cyanides will yield toxic gases such as carbon dioxide, hydrogen sulfide, and hydrogen cyanide.

HAZARDOUS DECOMPOSITION OR BY-PRODUCTS: Hydrogen fluoride gas.

HAZARDOUS POLYMERIZATION: Has not been reported.

SECTION 11: TOXICOLOGICAL INFORMATION

RTECS#:

CAS# 7732-18-5: ZC0110000

MATERIAL SAFETY DATA SHEET

FILE NO.: MSDS-201071 Ver. 1.0

MSDS DATE: 09/22/2011

E-Pure CyTOF Washing Solution

CAS# 7664-39-3: MW7875000

LD50/LC50:

CAS# 7732-18-5:

Oral, rat: LD50 = >90 mL/kg;

CAS# 7664-39-3:

Inhalation, mouse: LC50 = 342 ppm/1H;

Inhalation, mouse: LC50 = 5000 mg/m³/5M;

Inhalation, mouse: LC50 = 270 mg/m³/60M;

Inhalation, rat: LC50 = 1276 ppm/1H;

Inhalation, rat: LC50 = 1100 mg/m³/60M;

Human LCLo inhalation: 50 ppm/30M. Inhalation LC50 (mouse): 170 ppm/4H.

Carcinogenicity:

CAS# 7732-18-5: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

CAS# 7664-39-3: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: Epidemiological study by Derryberry et al. indicates a threshold for minimal increases (Grade I) in bone density caused by fluoride (fluorosis) is below 3.38 mg/m³ of fluoride (4.3 ppm HF). Grade I fluorosis results in no medically recognized dysfunction. Well-defined incidents of fluorosis are associated with intake levels of 20 mg/d in adults. In children, 4 mg fluoride/d can produce mottling of the teeth.

Teratogenicity: No information available.

Reproductive Effects: See actual entry in RTECS for complete information.

Mutagenicity: See actual entry in RTECS for complete information.

Neurotoxicity: No information available.

Other Studies: No information available.

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity: No data available. Fish (fresh water) 60 ppm lethal (time period not specified).

Environmental: No information available.

Physical: No information available.

Other: Log P (oct) = 0.23 (estimated)

SECTION 13: DISPOSAL CONSIDERATIONS

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.

RCRA U-Series: CAS# 7664-39-3: waste number U134 (Corrosive waste, Toxic waste).

SECTION 14: TRANSPORT INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION

PROPER SHIPPING NAME: Hydrofluoric Acid

HAZARD CLASS: 8

ID NUMBER: UN1790

PACKING GROUP: II

CANADA TDG:

PROPER SHIPPING NAME: Hydrofluoric Acid

HAZARD CLASS: 8(6.1)(9.2)

ID NUMBER: UN1790

PACKING GROUP: II

MATERIAL SAFETY DATA SHEET

FILE NO.: MSDS-201071 Ver. 1.0

MSDS DATE: 09/22/2011

E-Pure CyTOF Washing Solution

SECTION 15: REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS

TSCA (TOXIC SUBSTANCE CONTROL ACT): CAS# 7732-18-5 is listed on the TSCA inventory.

CAS# 7664-39-3 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 7664-39-3: 100 lb final RQ; 45.4 kg final RQ

SARA Section 302 Extremely Hazardous Substances

CAS# 7664-39-3: 100 lb TPQ

SARA Codes

CAS # 7664-39-3: immediate, delayed.

Section 313

This material contains Hydrofluoric acid (CAS# 7664-39-3, 47-51%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 7664-39-3 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 7664-39-3 is listed as a Hazardous Substance under the CWA.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.

None of the chemicals in this product are listed as Toxic

Pollutants under the CWA.

OSHA:

CAS# 7664-39-3 is considered highly hazardous by OSHA.

STATE:

CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

CAS# 7664-39-3 can be found on the following state right to

know lists: California, New Jersey, Pennsylvania, Minnesota, and Massachusetts.

California Prop 65:

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T+ C

Risk Phrases:

R 26/27/28 Very toxic by inhalation, in contact with skin and if swallowed.

R 35 Causes severe burns.

Canada - WHMIS

This product has a WHMIS classification of D1A, E, D2A. This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 7664-39-3 is listed on the Canadian Ingredient Disclosure List

Safety Phrases:

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S 36/37/39 Wear suitable protective clothing, gloves and eye/face protection.

S 45 In case of accident or if you feel unwell, seek medical advice

immediately (show the label where possible).

S 7/9 Keep container tightly closed and in a well-ventilated place.

WGK (Water Danger/Protection)

CAS# 7732-18-5: No information available.

CAS# 7664-39-3: 1

Canada - DSL/NDSL

CAS# 7732-18-5 is listed on Canada's DSL List.

CAS# 7664-39-3 is listed on Canada's DSL List.

SECTION 16: OTHER INFORMATION

DISCLAIMER: The statements contained herein are offered for information purposes only and are based upon technical data. DVS Sciences Inc. believes them to be accurate at the date of publication, but does not purport to be all-inclusive. The above-stated product is intended for use only by persons having the necessary technical skills and facilities for handling the product at their discretion and risk. Since conditions and manner of use are outside our control, we (DVS Sciences Inc.) make no warranty of merchantability or any such warranty, express or implied with respect to information and we assume no liability resulting from the above product or its use. Users should perform their own investigations to determine suitability of information and product for their particular purposes.