

OVERVIEW – AQUAOX INFECTION CONTROL SYSTEM

The following describes how Aquaiox LLC and Greenspeed USA LLC combine to deliver **CSS** (Cleaning and Sanitizing System) and **ICS** (Infection Control System).

Aquaiox LLC is a process engineering company specializing in the development and use of alternative cleaning and disinfection technologies to protect against the spread of infectious pathogens. We manufacture, distribute, install and service *systems* that produce **EPA-registered** Electrochemical Activated solutions that can replace conventional chemicals. Infection Control staff then applies Electrochemically Activated ('ECA') solutions using proprietary equipment and techniques to improve productivity by reducing labor time and human error. ECA solutions clean and degrease surfaces, destroy pathogens, viruses, algae and fungi and are non-toxic, non-corrosive, eco-friendly, fast acting and safe to use.

Our ECA solutions are either supplied to facilities or ECA systems are installed in facilities such as hospitals, hotels and cruise ships to produce EPA registered antimicrobial disinfectants on-site and on-demand. Operational costs are reduced when clients replace or significantly reduce the purchase of traditional chemicals, bleaches, surfactants and even antibiotics.

Greenspeed USA LLC provides cleaning, sanitizing and disinfecting technologies, products and services for the healthcare, institutional and industrial markets.

Our Greenspeed system-based programs are dramatically effective in reducing viruses and microbes such as Methicillin-Resistant Staphylococcus Aureus (**MRSA**), Vancomycin-resistant Enterococcus (**VRE**), Multidrug-resistant gram-negative bacilli (**MDR-GNB**), and Clostridium difficile (**C.diff**) to **CDC**-acceptable levels without the use of traditional chemicals, bleaches or surfactants and is completely safe for patients, students, employees and the environment.

We confirm that electro-chemically generated NaOH (sodium hydroxide) and electro-chemically generated HOCl (Hypochlorous Acid) are without parallel as best practice cleaning and disinfecting solutions, especially when following a protocol that includes both high-quality microfiber and electrostatic spraying.

In general, the Aquaiox all-purpose cleaner and the Aquaiox broad spectrum disinfectant are safe, effective, cost-efficient and do not have any adverse effects on the environment or the health of the environmental service staff.

Within Aquaiox we have developed an Infection Control System (**ICS**) that is targeted to terminal cleaning of hospital isolation precaution rooms, where traditional cleaning/disinfecting methods and chemicals are not adequate.

After replacing most (if not all) chemicals, UNC Johnston is successfully operational with ICS.

- During a 2-year period, we improved cleanliness significantly and dramatically reduced cost of corrosion damage to surfaces and equipment.
- UNC Johnston experienced further cost reduction by eliminating handling of hazardous chemicals and related OSHA compliance requirements.
- HAI (Hospital Acquired Infection) has steadily fallen for the last 18-months due to the fact that there has not been a single reported case of HAI.

- Totally in favor of using our ICS System, the Environmental Service Staff reports that ICS has proven to be less labor-intensive, while aiding them to do a much more effective job.
- Worth mentioning is that not having to handle hazardous chemicals makes staff feel safe and (error-free) confident.

Aquaiox Disinfectant is produced onsite or is bottled for delivery.

Offering powerful ppm strength for healthcare facilities, our most commonly used disinfectant is AX-275 – measured in Free Available Chlorine at 275ppm FAC and pH neutral at ~6.5.

For cleaning and general use, our EAW-1 Generator also has the onsite capability to produce AX-112 Cleaner. The cleaner is very effective on all surfaces and has natural 'surfactant' properties which, when applied with high-quality microfiber, effectively removes all protein, dirt and biofilm from surfaces, preparing the surface to be disinfected. AX-112 Cleaner and AX-275 Disinfectant work hand in hand without any adverse chemical reaction.

The linked Infection Control and Cleaning & Sanitizing **Systems** enable properties to achieve more sustainable, more effective cleaning/disinfecting of their facilities. The Aquaiox cleaning and sanitizing standard is enhanced by using high-quality, ergonomic, microfiber tools and electrostatic sprayers that achieve (first-ever) 100% coverage.

Making the switch from traditional chemicals (and their protocols) to **Aquaiox Systems** happily surprises users with how easy it is to transition to a safer, more productive (less-labor-intensive) protocol.

Good results pay off for all parties – patients, students, employees and visitors.

Aquaiox ICS protocol requires that directors of environmental services staff monitor their staff effectiveness by testing with specified equipment. Measurement confirms outstanding results that make Infection Control staff proud of their higher achievement, and management soon discovers that staff is healthier, has greater job satisfaction and is more motivated.

Let's not overlook the value of having truly clean, disinfected surfaces, public spaces and rooms ... to be enjoyed by all.

Michel van Schaik

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TECHNICAL SUMMARY & SAFETY DATA SHEETS**Aquaiox Disinfectant 275 | Aquaiox Disinfectant 525****PRODUCT EFFICACY**

Aquaiox Disinfectant **275** and Aquaiox Disinfectant **525** are **Hypochlorous Acid** solutions generated electrochemically from Sodium Chloride. Both products are **EPA registered antimicrobial pesticides bearing a Hospital and a General/Broad Spectrum Disinfectant claims per FIFRA Section 3(c)(5)**. Using established ASTM standards, AOAC methods and EPA guidelines, a series of studies have been conducted to characterize the solutions' abilities to disinfect and reduce microorganisms through a one-step disinfecting mechanism. These studies are further discussed below.

1. AOAC Use-Dilution Method (AOAC 955.14, 955.15, 964.02)

The AOAC Use-Dilution Test is considered a "high-level" test for disinfectants, i.e., an antimicrobial solution must have appreciable biocidal activity on a relatively short time frame, < 10 minutes, to pass the test.

A culture of the challenge microorganism, listed in Table 1 below, is amended with a 5% organic soil load to mimic a "dirty" surface to challenge test article's one-step cleaning and disinfecting efficacy. The bacteria is then cultured for 48 hours and the 48-hour is dried onto a number of small, cylindrical, and stainless steel test surfaces test surfaces called penicylinders to create a contaminated surface. At least 10 contaminated surfaces are prepared.

Using a wire hook, each dry, contaminated test surface is then transferred individually to a test tube filled with the the test article (Aquaiox Disinfectant 275 or 525) for the exposure (contact) time of 10 minutes at room temperature (20 – 25°C). After the exposure time has elapsed, the treated test surfaces are transferred to test tubes containing a liquid growth medium that will neutralize the action of the disinfectant. The treated test surfaces are then incubated in the neutralizing growth medium for 48 hours to recover the microorganism. After incubation in the neutralization media, the number of test tubes showing recovery of the challenge microorganism is recorded.

TABLE 1. Aquaiox Disinfectant evaluated against Gram+ and Gram- Bacteria in the presence of 5% Organic Soil Load

Exposure Time: 10 minutes Sample Dilution: Ready to Use (RTU)			
Test Organism	Strain	Number of Positive Carriers per Number Tested	Test Result
<i>Pseudomonas aeruginosa</i>	ATCC 15442	0 / 10	Pass
<i>Staphylococcus aureus</i>	ATCC 6538	0 / 10	Pass
<i>Staphylococcus aureus</i> (HA-MRSA)	ATCC 33591	0 / 10	Pass
<i>Salmonella enterica</i>	ATCC 10708	0 / 60	Pass
<i>Escherichia coli</i> (NDM-1)	ATCC BAA-2469	0 / 10	Pass
Vancomycin Resistant <i>Enterococcus faecalis</i> (VRE)	ATCC 700221	0 / 10	Pass

Conclusion: Under the condition of this study, in the presence of 5% organic soil load, Aquaiox Disinfectant, ready to use, demonstrated efficacy against the above listed microorganisms following a 10-minute exposure time at room temperature.

2. AOAC Tuberculocidal Activity of Disinfectants Test Method

The AOAC Tuberculocidal Activity of Disinfectants Test is considered a "high-level" test for disinfectants, i.e., an antimicrobial solution must have appreciable biocidal activity on a relatively short (<10 minutes) time frame to pass the test.

A culture of the *Mycobacterium bovis BCG*, an EPA recommended surrogate of Mycobacterium tuberculosis, is amended with a 5% fetal bovine serum to mimic a "dirty" surface to challenge test article's one-step cleaning and disinfecting efficacy. The bacteria is then cultured for 21 days, and dried onto a number of penicylinders to create a test surface. At least 10 contaminated test surfaces are created.

Each dry, contaminated test surface is then transferred, individually, to a test tube filled with the test article for the exposure (contact) time of 10 minutes near room temperature. After the contact time has elapsed, the treated test surfaces are transferred to test tubes containing a liquid medium that has been amended with chemical agents to immediately neutralize the action of the disinfectant.

Immediately after transfer from the disinfectant into the neutralizer, the treated test surfaces are transferred into bacterial growth medium and are incubated for 60 days. After the 60-day incubation, the number of tubes showing growth of *Mycobacterium bovis BCG* is recorded.

Conclusion: Under the condition of this study, in the presence of 5% organic soil load, Aquaox Disinfectant, ready to use, met the required performance criteria versus *Mycobacterium bovis* BCG following a 10-minute exposure time at room temperature.

TABLE 2. Aquaox Disinfectant evaluated against *Mycobacterium bovis* BCG in the presence of 5% Fetal Bovine Serum

Exposure Time: 10 minutes Sample Dilution: Ready to Use (RTU)		
Challenge Suspension Initial Population (CFU/mL)	Number of Positive Carriers per Number Tested (All Media Types)	Test Result
2.850×10^7	0 / 10	Pass
2.850×10^7	0 / 10	Pass

3. Viricidal Hard Surface Disinfection Evaluation using ASTM E1053 Method

This test is performed to verify the performance capability of a test substance as a viricidal agent.

Aquaox Disinfectant has been tested against four different viruses, HIV-1, H1N1, Rhinovirus 16 and Murine Norovirus. The test virus, HIV-1, H1N1 or Rhinovirus 16, is loaded with a 5% organic soil load to mimic a “dirty” surface to challenge test article’s one-step cleaning and disinfecting efficacy. An inoculum of the test virus is spread over the carrier surface and allowed to dry. The test virus is then inoculated onto a hard, nonporous surface (100 x 15 mm glass Petri dish) to create a dried film carrier. Two dried film carriers are prepared per lot of test substance for surrogate viruses and one dried film carrier for non-surrogate viruses.

The dried virus films are treated with the test article for the exposure (contact) time of 10 minutes near room temperature. At the close of the contact time, the test carrier films are neutralized by addition of a neutralizer solution followed by scraping of the carrier surface using a cell scraper.

The test suspensions are then plated, cultured, and observed for virus presence or absence.

PRODUCT SAFETY

A nonclinical toxicology investigation has been done on the above products as following. The Aquaox Disinfectant products contain Hypochlorous Acid as the active ingredients. The only inactive ingredient in the product solution is residual Sodium Chloride from the electrolysis process. Sodium Chloride (CAS RN 8028-77-1) is listed as an inactive ingredient in FDA CDER database for use in approved drug products. Moreover, the Sodium Chloride used in Aquaox electrolysis process is NSF certified. Therefore, the presence of Sodium Chloride in the Aquaox Disinfectant products does not present a safety concern.

A series of non-clinical toxicology testing has been done on the product solutions to assess their potential local and systemic toxicity. The toxicology studies were conducted at NAMSA and IIT Research Institute (IITRI), both of which being AALAC approved facilities. All toxicology studies conducted were in compliance with Good Laboratory Practice (GLP) regulations.

The GLP toxicology testing program was based on ISO-10993 requirements on biocompatibility testing for a surface device with contact with breached or compromised surface. These studies, together with the study results, are listed in Table 4.

Conclusion

Exposure to L-929 cells *in vitro* to the product solutions produced a slight cell lysis, which was not considered cytotoxic per USP requirement. Product solutions were also not considered a primary dermal or ocular irritant, and did not show sensitization potential in the dermal and ocular irritation studies. Product was considered non-toxic in both the acute oral toxicity study and the single dose inhalation study when tested at the maximal feasible concentration. In a 28-day repeated dose toxicity study, topical application of the product to intact and wounded skin areas did not result in any treatment-related skin irritation or wound healing issues. Therefore, the results of the toxicology testing program confirmed the biocompatibility and safety profile of the product solutions for its intended use.

Continue for **Microfiber Qualities** and for **Safety Data Sheets**

MICROFIBER for QUALITY SUPERIOR CLEANING

Microfiber is a man-made synthetic fiber of linear density below 1 denier. It is constructed of a star shaped polyamide (nylon) center surrounded by pie-shaped polyester wedges. During manufacturing, these wedges separate or split from the center to form individual “**blades**”.

The average fiber is 100 times smaller than a human hair. These tiny fibers **penetrate microscopic surface pores** and **possess a positive electrostatic charge** which attracts, collects and holds dirt, dust, bacteria, pollen, and other organic particles that have a negative charge. Also, the density of the material enables it to **hold six times its weight in water**, making it **more absorbent than a conventional cotton cloth or mop**.

The key performance characteristics of microfiber is the size, shape and concentration of split microfiber in the product.

It is virtually impossible for the human eye to see the differences between microfiber products, but under magnification the differences become distinct. The quantity of microfiber varies greatly from one product to another. High performance cleaning textiles have over 300,000 fibers “blades” per square inch that reach into microscopic crevices to remove pathogens from environmental surfaces. Fibers with blades smaller than .1 micron are needed to pick up many pathogens, such as H1N1. A product with a high concentration of these precision fibers means greater surface contact for better performance.¹

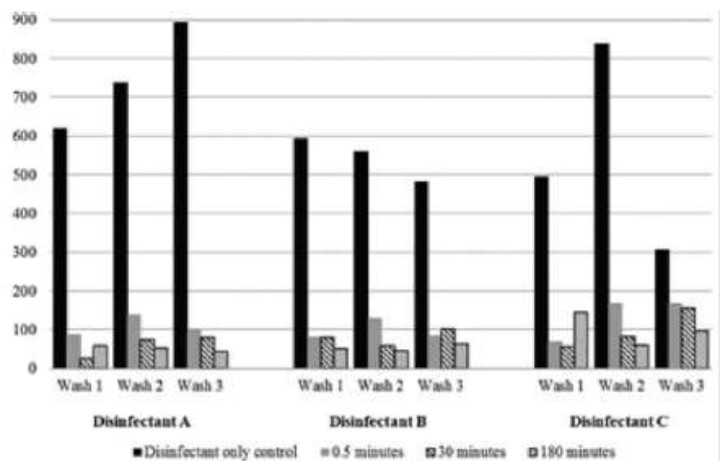
- **Recent research demonstrated that microfiber cloths can remove significantly more C. difficile spores from surfaces compared with cotton cloths.** In addition, the **ability of microfiber cloths to retain spores** provides convincing evidence that this cleaning approach could reduce transfer of microorganisms.²
- In November 2002, the EPA published Environmental **Best Practices for Health Care Facilities**, which emphasized the use of microfiber technology in hospitals. Several studies have determined that microfiber is better than cotton at capturing bacteria.
- The University of California, Davis Medical Center compared the amount of bacteria picked up by a cotton-loop mop and by a microfiber mop. **The cotton-loop mop reduced bacteria on the floors by 30%, whereas the microfiber mop reduced bacteria by 99%.³**
- Because microfiber mopping system uses less water and chemicals, it reduces the amount of water and chemicals handled and it eliminates the need to wring the heavy cotton mops, resulting in less potential for worker injury.

THE PROBLEMS WITH COTTON

1. **Quaternary ammonia compounds (QAC) concentrations are reduced by up to 85.3% after exposure to cotton towels resulting in failure of the disinfectants exposed to cotton towels in 96% of the GSTs.⁴**
2. Cotton is an organic product and can serve as a source of nutrition for bacteria.
3. **Cotton fibers are too large to trap and remove bacteria, viruses and small dirt particles.** Lint, debris, and hair becomes entangled in the fibers and often remains in the product throughout the laundering and drying processes.
4. Cotton fibers break down easily and transfer to environmental surfaces.

blades/sq. inch Microfiber blade size
ORIGINAL cloth 862,000 0.1 denier
BASIC cloth 540,000 0.1 denier

1. Infection Prevention through Superior Cleaning, Smart Solutions, February 2010.
2. Microfiber cloths reduce the transfer of Clostridium difficile spore to environmental surfaces compared with cotton cloths, American Journal of Infection Control 43 (2015) 686-9.
3. Environmental Protection Agency, Using Microfiber Mops in Hospitals, Environmental Best Practices for Health Care Facilities. 2002. Region 9 Pollution Prevention Program.
4. Decreased activity of commercially available disinfectants containing quaternary ammonia compounds when exposed to cotton towels, American Journal of Infection Control, 41 (2013) 908-11.



Release of Clostridium difficile spores from an inoculated microfiber and cotton cloths to a clean ceramic surface. Inoculated microfiber and cotton cloths were used to evaluate the transfer of spores from the cleaning cloths to ceramic surfaces using the drill apparatus. The results for microfiber cloths are represented by black bars, and those for cotton cloths are shown as white bars. cfu, colony forming units.²



Safety Data Sheet

AQUAOX DISINFECTANT 275

SECTION I – IDENTIFICATION

Product Name: Aquaiox Disinfectant 275 | Product Number: AX275
Product Description: Hypochlorous Acid Solution Generated Electro-Chemically from Diluted Brine
CAS Number: None (Mixture)
Recommended Use: This product is a ready-to-use, one-step cleaner and disinfectant for general cleaning and disinfecting on hard, non-porous surfaces.
Restricted Use: This product is not for human or animal use.
Manufacturer: Aquaiox LLC
Address: 220 S. Second Street, Dillsburg, PA 17019 USA
Number: (800) 790-7520 | Chemtrec Emergency Number: (800)-424-9300

SECTION II – HAZARDS IDENTIFICATION

HMIS Rating:

- Health = 0
- Flammability = 0
- Physical = 0
- Reactivity = 0

NFPA/HMIS Definitions

0 = Minimal Hazard
1 = Slight Hazard
2 = Moderate Hazard
3 = Serious Hazard
4 = Severe Hazard

Personal Protection Index: B (Eye Protection and Gloves)

Hazard Information Disclosures:

TSCA: All chemicals in this product are listed on the EPA TSCA inventory list.
CERCLA / SARA: This product does not fall under any hazardous categories under SARA Sections 311 and 312.
OSHA: This product is not a hazardous chemical as defined by the OSHA Hazard Communication Standard, 29 CFR § 1910.1200.

Product Label on Hazard Information:

- Avoid Contact with Eyes and Skin
- Wash Hands after Handling Product
- Keep out of Reach of Children

SECTION III – COMPOSITION AND INFORMATION ON INGREDIENTS

Component(s)	CAS #
Water	7732-18-5
Hypochlorous Acid	7790-92-3
Sodium Hypochlorite	7681-52-9
Sodium Chloride	7647-14-5

The product contains approximately 300ppm free available chlorine (FAC).

SECTION IV – FIRST-AID MEASURES

Skin Contact: In case of contact, flush with plenty of water. Cold water may be used. Wash clothing before reuse. Seek medical attention if skin irritation occurs.

Eye Contact: Check for and remove any contact lenses. Flush eyes with running water for at least 15 minutes with eyelids open. Cold water may be used. Seek medical attention if eye irritation occurs.

Inhalation: If inhaled, remove to fresh air. Seek medical attention if not breathing or breathing is difficult.

Ingestion: If swallowed, rinse mouth with water and drink plenty of fluids. Seek medical attention if discomfort occurs.

SECTION V – FIRE-FIGHTING MEASURES

Not Applicable, this product is Non-Flammable and Non-Explosive. No extinguishing techniques or equipment are required.

SECTION VI – ACCIDENTAL RELEASE MEASURES

In case of spill or leakages, dike spill with inert absorbent materials (e.g. sand, "oil-dry" or other commercially spill absorbents) to contain and soak spilled liquid. Place wastes into an appropriate waste disposal container.

SECTION VII – HANDLING AND STORAGE

Handling: No special handling requirements; follow use instructions on product label. Open air or good room ventilation and appropriate PPE are adequate for the safe use of this product.
Storage: Keep container tightly closed in a dry and well-ventilated place at room temperature. Avoid direct light exposure, freezing and extreme heat.

SECTION VIII – EXPOSURE CONTROLS AND PERSONAL PROTECTION

OSHA PEL: Unknown. Cal/OSHA PEL: Unknown.
NIOSH REL: Unknown. ACGIH TLV: Unknown.
Engineering Control: None Required. Open air or good room ventilation is adequate for the safe use of this product.

Personal Protective Equipment (PPE):

Protective Clothing: Wear proper personal protective equipment and clothing to care for spill situation.
Hand Protection: Handle with gloves; use rubber, neoprene, or other chemically impervious gloves when handling this product.
Eye Protection: Wear safety glasses when handling this product.

SECTION IX – PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Color:	Clear
Odor:	Slight Chlorine Odor
pH:	6.2 – 7.0
Specific Gravity (H ₂ O = 1 at 20°C):	1.00 – 1.06
Density:	8.34 lbs/gal
Viscosity:	Comparable to Water
Boiling Point:	Comparable to Water
Evaporation Rate:	Comparable to Water
Solubility:	Complete in Water
Flammability:	Non-Flammable
Explosive Limits:	Non-Explosive

SECTION X – STABILITY AND REACTIVITY

Reactivity: Not Reactive under recommended handling and storage conditions.
Chemical Stability: Stable under recommended handling and storage conditions.
Hazardous Reactions: Product is Not Hazardous.
Conditions to Avoid: Direct light exposure, freezing and extreme heat.
Materials to Avoid: Strong oxidizing agents, strong acids and organic materials.
Hazardous Decomposition Products: May form under fire conditions; nature of decomposition products is unknown.
Hazardous Polymerization: Will not occur.

SECTION XI – TOXICOLOGICAL INFORMATION

Route of Entry / Exposure: Skin Contact Eye Contact
Inhalation Ingestion

Potential Acute Health Effects:

Skin Contact: No potential health effects; product is non-hazardous.
Eye Contact: No potential health effects; product is non-hazardous.
Inhalation: No potential health effects; product is non-hazardous.
Ingestion: No potential health effects; product is non-hazardous.

Potential Chronic Health Effects:

Carcinogenic Effects:	Not Applicable.	Mutagenic Effects:	Not Applicable.
Teratogenic Effects:	Not Applicable.	Developmental:	Not Applicable.

Numerical Measures of Toxicity: Unknown.

Preparation Date of Latest Revision: March 2, 2016



Safety Data Sheet

AQUAOX DISINFECTANT 525

SECTION I – IDENTIFICATION

Product Name: Aquaox Disinfectant 525 | Product Number: AX525
Product Description: Hypochlorous Acid Solution Generated Electro-Chemically from Diluted Brine
CAS Number: None (Mixture)
Recommended Use: This product is a ready-to-use, one-step cleaner and disinfectant for general cleaning and disinfecting on hard, non-porous surfaces.
Restricted Use: This product is not for human or animal use.

Manufacturer: Aquaox LLC
Address: 220 S. Second Street, Dillsburg, PA 17019 USA
Number: (800)-790-7520 | Chemtrec Emergency Number:(800)-424-9300

SECTION II – HAZARDS IDENTIFICATION

HMIS Rating:

- Health = 0
- Flammability = 0
- Physical = 0
- Reactivity = 0

NFPA/HMIS Definitions

- 0 = Minimal Hazard
- 1 = Slight Hazard
- 2 = Moderate Hazard
- 3 = Serious Hazard
- 4 = Severe Hazard

Personal Protection Index: B (Eye Protection and Gloves)

Hazard Information Disclosures:

TSCA: All chemicals in this product are listed on the EPA TSCA inventory list.
CERCLA / SARA: This product does not fall under any hazardous categories under SARA Sections 311 and 312.
OSHA: This product is not a hazardous chemical as defined by the OSHA Hazard Communication Standard, 29 CFR § 1910.1200.

Product Label on Hazard Information:

- Avoid Contact with Eyes and Skin
- Wash Hands after Handling Product
- Keep out of Reach of Children

SECTION III – COMPOSITION AND INFORMATION ON INGREDIENTS

Component(s)	CAS #
Water	7732-18-5
Hypochlorous Acid	7790-92-3
Sodium Hypochlorite	7681-52-9
Sodium Chloride	7647-14-5

The product contains approximately 575ppm free available chlorine (FAC).

SECTION IV – FIRST-AID MEASURES

Skin Contact: In case of contact, flush with plenty of water. Cold water may be used. Wash clothing before reuse. Seek medical attention if skin irritation occurs.

Eye Contact: Check for and remove any contact lenses. Flush eyes with running water for at least 15 minutes with eyelids open. Cold water may be used. Seek medical attention if eye irritation occurs.

Inhalation: If inhaled, remove to fresh air. Seek medical attention if not breathing or breathing is difficult.

Ingestion: If swallowed, rinse mouth with water and drink plenty of fluids. Seek medical attention if discomfort occurs.

SECTION V – FIRE-FIGHTING MEASURES

Not Applicable, this product is Non-Flammable and Non-Explosive. No extinguishing techniques or equipment are required.

