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Material Safety Data Sheet OptiXtal SuperXcap Supercapacitors

This product is an "Article" under the U.S. Federal OSHA Hazard Communication Standard (29 CFR 1910.1200), EU Directives, Japanese, Chinese and Korean regulations and the Canadian Workplace Hazardous Materials Standard.

Refer to Section XV (Regulatory Information) for specific regulatory citations. As an article, this product presents negligible health and physical hazards under reasonably anticipated conditions of use. Accordingly, a Material Safety Data Sheet (MSDS) is not required for this product under the standards cited above. This document is prepared as a courtesy to provide persons using this product with additional safety and regulatory information. Users are also encouraged to access the applicable SDS for the internal components referenced in Section III below.

1. Substance and Company Identification

Date First Prepared: 3/11/2017

Updated: 10/2024

Identification of the Product: **Supercapacitors**

Synonyms: ultracapacitors, Electric Double Layer Capacitors, EDLC

Used to improve battery life, battery performance, and to replace batteries in special applications

CAS No.: N/A

Company Identification: OptiXtal, Inc.,
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Emergency Contact: CHEMTREC (1-800-424-9300).

2. Hazards Identification

2.1 Classification of the Product

This product is considered a manufactured article and presents negligible health hazards under typical use conditions. Misuse of this product, such as deliberate destruction, overcharging or heating, may release internal components contained within the sealed case. Skin contact with the carbon may cause mild irritation.

2.2 GHS Label elements, including precautionary statements



Pictogram
Signal Word: Caution.

2.3 Hazards

FLAMMABILITY HAZARDS:

The activated carbon may be combustible and may be ignited if exposed to an ignition source or if subjected to direct flame. If involved in a fire, the chemicals contained in the case may decompose and produce toxic gases (e.g. carbon oxides, propylene glycol, hydrogen fluoride and boron compounds). During a fire involving this product care should be taken to avoid inhalation of fumes. Misuse of this product, such as overcharging, may release these toxic fumes as well.

REACTIVITY HAZARDS:

Hydrogen fluoride will gradually be released upon exposure of the electrolyte solution to water.

ENVIRONMENTAL HAZARDS:

Negligible.

EMERGENCY CONSIDERATIONS:

Emergency responders must wear the proper personal protective equipment (and have appropriate fire-suppression equipment) suitable for the situation to which they are responding.

Appropriate precautions should be taken in the event of a container rupture under emergency conditions including fire.

3. Composition

Our product is a solid article consisting of an opaque plastic and metal packaging filled with activated carbon and an electrolyte solution that is completely adsorbed in the carbon. The following information is for the hazardous components in our article. As manufactured, exposure

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to individual electrolyte components is not expected. If this product is heated, cut or otherwise manipulated in such a way that will release the internal components or produce fumes, exposure to these components is possible.

Quaternary Salt	Percent by weight: 5-15%
CAS NO.: Trade Secret	
Propylene Carbonate	
CAS NO.: 108-32-75	Percent by weight: 10-20

4. First Aid Measures

Damaged ultracapacitors may release electrolyte containing Propylene Carbonate and the small amount of dissolved Quaternary salt. The salt may manifest itself as a white crystal or powder when dry, and can be washed away with plenty of water, if anybody accidentally comes in contact with it.

Propylene Carbonate is moderately toxic by inhalation and/or skin adsorption. If necessary, physicians should refer to Section XI (Toxicological Information) in the event there is a severe inhalation, skin contact or ingestion exposure to the electrolyte solution. Under these circumstances, take a copy of this MSDS to the physician or health care professional with the exposed individual. First-aid measures applicable to contamination with the electrolyte solution are as follows:

RECOMMENDATIONS TO PHYSICIANS:

Eliminate exposure and treat symptoms.

SKIN EXPOSURE:

If skin exposure to electrolyte occurs, flush contaminated area liberally with water. Seek medical attention if any adverse effects occur after flushing.

EYE EXPOSURE:

If liquid, vapors or fumes from the electrolyte contained in this product contaminate the eyes, rinse eyes under gently running water. Use sufficient force to open eyelids and then "roll" eyes while flushing. Minimum flushing is for 20 minutes. Seek medical attention.

INHALATION:

If vapors or fumes from the electrolyte contained in this product are inhaled, remove exposed person to fresh air. If necessary, use artificial respiration to support vital functions and seek medical attention.

INGESTION:

In the unlikely event that the electrolyte contained in this product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, DO NOT INDUCE VOMITING. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or unable to swallow. If victim is convulsing, maintain an open airway and obtain immediate medical attention

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ELECTRIC SHOCK:

Victim should not be touched if a connection to the product still exists. Once the victim is no longer in contact with the device and if electric shock from the device has resulted in cessation of breathing, immediately begin cardiopulmonary resuscitation (CPR). If no person that is trained in CPR is available, obtain immediate medical advice on how to perform CPR. If the heart has stopped, a qualified person should begin CPR. Immediate medical attention should be sought while attempts to revive the victim are ongoing. If an automatic external defibrillator (AED) is available, immediately begin treatment with AED.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

No medical conditions are known to be aggravated by exposure to this product.

5. Fire Fighting Procedures

FLASH POINT: Not applicable for product. For Electrolyte Solution: 141.8°C (287.2°F)

AUTOIGNITION TEMPERATURE: Not applicable for product. For Propylene Carbonate: 430-510°C (806-950°F)

FLAMMABLE LIMITS (in air by volume, %): Not applicable for product.

For Propylene Carbonate @ 200°C: LEL: 4.7%; UEL: 21%

FIRE EXTINGUISHING MEDIA: Use fire extinguishing media appropriate for surrounding fire.

UNSUITABLE FIRE EXTINGUISHING MEDIA: None known.

SPECIAL HAZARDS ARISING FROM THE PRODUCT: This product is not flammable under normal operational and non- operational conditions; however if this product is punctured or exposed to high temperatures, as may be encountered in a fire situation, the saturated activated carbon may ignite. Due to the small amount of electrolyte solution in each device and the presence of activated carbon, ultracapacitors contain little or no free-standing liquid and so are not anticipated to pose a significant fire hazard under normal conditions of storage, use and shipment.

Sealed devices involved in a fire may rupture explosively if sufficiently heated for a long period of time. If involved in a fire, the chemicals contained in the case may decompose and produce toxic gases (e.g. carbon oxides, propylene glycol, hydrogen fluoride and boron compounds).

Hydrogen fluoride will gradually be released upon exposure of the electrolyte solution to water.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL PROTECTIVE ACTIONS FOR FIRE-FIGHTERS: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Chemical resistant clothing may be necessary. Move containers from fire area if it can be done without risk to personnel. Water spray can be used to cool fire-exposed capacitors. Water fog or spray can also be used by trained firefighters to disperse this product's vapors and to protect personnel. If possible, prevent runoff water from entering storm drains,

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bodies of water, or other environmentally sensitive areas.

6. Accidental Release Measures

Because the hazardous constituents are adsorbed on carbon media and very little free liquid is available for release to the environment, this product does not normally represent a spill hazard. If failures occur or misuse of the product results in a release or spill of the electrolyte solution, releases should be cleaned up by trained personnel using appropriate cleaning tools and techniques. Proper personal protective equipment (PPE) should be used. Eliminate all sources of ignition before cleanup begins. Secure cleanup residue in closed containers and manage residuals properly (see Section 13 - Disposal Considerations). Call CHEMTREC (1-800-424-9300).

7. Handling & Storage

GENERAL SAFE WORK PRACTICES AND GOOD HYGIENE PRACTICES:

Do not eat, drink, smoke, or apply cosmetics while handling this article. Wash hands thoroughly after handling this article. Avoid breathing gases generated by this article. Use in a well-ventilated location. Follow SPECIFIC USE INSTRUCTIONS supplied the manufacturer.

STORAGE AND HANDLING PRACTICES: Employees must be trained to properly use this article. These articles are capable of accepting, storing, or releasing an electric charge. Although these articles are shipped uncharged and operate singly at low voltages, when charged and shorted, arcing may occur and result in molten metal splattering and arc-flash hazards. Remove hand jewelry before handling these articles. Keep away from heat, sparks, and other sources of ignition. Do not charge in unventilated areas.

When stacking the articles upon one another, place insulating and cushioning layers between each unit, to avoid damage and short-circuiting. Do not use organic solvents other than recommended chemical cleaners. Store in a cool, dry, well-ventilated place away from combustible materials and away from material with which it is incompatible (see Section X, Stability and Reactivity). Post warning and "NO SMOKING" signs in storage and use areas as appropriate.

Have appropriate fire extinguishing and spill response equipment in the storage area (i.e., sprinkler system, portable fire extinguishers, sorbents, etc.). Inspect all incoming packages before storage to ensure that they are properly labeled and not damaged.

8. Exposure Controls/Personal Protection

NORMAL USE: NOT APPLICABLE – Finished commercial product.

FOR OPENED UNITS: As an intact, sealed, manufactured article, exposure to individual components is not possible. If this product leaks, fails, is cut or is otherwise manipulated in such a way that the contents are released, exposure to the internal components is possible. The only internal component that is dispersible is the electrolyte; therefore, the following information applies to the electrolyte solution only.

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Chemical Name CAS#	Applicable Exposure Limits						
	OSHA-PELs		ACGIH-TLVs		ACGIH-RELs		
	TWA	STEL	TWA	STEL	TWA	Skin Note	IDLH
	ppm	ppm	ppm	ppm	ppm		ppm
Quaternary Salt Trade Secret	NE	NE	NE	NE	NE	NE	NE
Propylene Carbonate 108-32-7	NE	NE	NE	NE	NE	NE	NE

(NE= Not Established)

9. Physical & Chemical Properties

Appearance (color, physical form, shape): Finished commercial product. Comes in various sizes and shapes.

Volatile Organic Compound (VOC) Content: Not applicable - Product not regulated for VOC Content at State or Federal level

10. Stability & Reactivity

Stability: Stable

Conditions to Avoid: Avoid exposure to or contact with sparks, flames, or other sources of ignition, extreme temperatures, and incompatible chemicals.

Incompatibility (Materials to Avoid): Electrolyte Solution: Strong reducing agents, strong oxidizers, strong acids, diphenyl sulfoxide, trichlorosilane, n-fluoro compounds, nitrating agents

Hazardous Decomposition Products: Products of thermal decomposition can include toxic gases (e.g. carbon oxides, propylene glycol, hydrogen fluoride and boron compounds). Hydrolysis:

Hydrogen fluoride will gradually be released upon exposure of the electrolyte solution to water.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Electrolyte Solution: Strong oxidizers, strong acids, glass, metal oxides.

Hazardous Polymerization: Will not occur

Conditions to Avoid: Avoid exposure to or contact with sparks, flames, or other sources of ignition, extreme temperatures, and incompatible chemicals.

11. Toxicological Information

This product is a finished commercial product. It is classified as an “article” and exempt under the federal OSHA Hazard Communication standard.

Chronic Effects: No chronic health effects reported.

Target Organs: No target organ effects reported.

Carcinogenicity: This finished consumer product is not carcinogenic

12. Ecological Information

This product is not expected to decompose in the environment. The following environmental data are available for components of the electrolyte solution.

MOBILITY:

This product has not been tested for mobility in soil. The following information is available for Propylene Carbonate.

The Koc of Propylene Carbonate is estimated as 14, using a log Kow of -0.41 and a regression-derived equation. According to a classification scheme, this estimated Koc value suggests that Propylene Carbonate is expected to have very high mobility in soil.

PERSISTENCE AND BIODEGRADABILITY:

If released to air, a vapor pressure of 0.045 mm Hg at 25°C indicates Propylene Carbonate will exist solely as a vapor in the ambient atmosphere. Vapor-phase Propylene Carbonate will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 4 days. Propylene Carbonate may also undergo direct photolysis since this compound contains a functional group that can absorb light greater than 290 nm, but the kinetics of this reaction are unknown. If released to soil, Propylene Carbonate is expected to have very high mobility based upon an estimated Koc of 14. Volatilization from moist soil surfaces is not expected to be an important fate process based upon an estimated Henry's Law constant of 3.4×10^{-8} atm-cu m/mole. Volatilization from dry soil surfaces is not expected to be an important fate process based upon the vapor pressure. Propylene Carbonate was biodegraded 80 percent in a single aerobic screening study during a 10 day incubation period. If released into water, Propylene Carbonate is not expected to adsorb to suspended solids and sediment in water based upon the estimated Koc. Volatilization from water surfaces is not expected to be an important fate process based upon this compound's estimated Henry's Law constant. Propylene Carbonate may undergo hydrolysis in the environment since this compound has functional groups susceptible to hydrolysis.

Bio Accumulation Potential: The metal and plastic case of this product will not bio accumulate. An estimated BCF of 3 was calculated for Acetonitrile, using a log KOW of -0.34 and a regression-derived equation. According to a classification scheme, this BCF suggests that the potential for bio concentration in aquatic organisms is low.

AQUATIC TOXICITY:

The release of a significant amount of electrolyte solution to an aquatic environment is unlikely. Quaternary ammonium compounds generally are aquatic toxins, and boron compounds tend to be toxic to aquatic organisms, particularly invertebrates. Do not allow electrolyte residues to enter storm drains or waterways.

13. Disposal Considerations

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These articles are not exempt from government solid and hazardous waste regulations. As solid, intact articles, they are not specifically listed as, nor do they exhibit any characteristics of a hazardous waste; however, they do contain materials that may become an environmental concern if disposed improperly. The primary material of potential concern is the electrolyte, which contains acetonitrile and the quaternary salt. These articles should be disposed only in facilities suitable for accepting industrial waste that do not allow supercapacitor components to be released into the environment, and not into municipal solid waste landfills. Check state and local regulations for any additional requirements, as these may be more restrictive than federal laws and regulations.

USEPA (RCRA) HAZARDOUS WASTE NUMBER: None

EUROPEAN WASTE CODES:

16 02 Wastes from Electrical and Electronic Equipment:

16 02 13: Discarded Equipment Containing Hazardous Components Other Than Those Mentioned in 16 02 09 to 16 02

14. Transport Information

U.S. DEPARTMENT OF TRANSPORTATION: This product is NOT classified as dangerous goods, per U.S. DOT regulations, under (see §173,176). Supercapacitors as articles are not specifically listed nor exempted from hazardous materials regulations (HMR). The materials comprising Supercapacitors are "...in a quantity and form that does not pose a hazard in transportation". Therefore, the ultracapacitors are not subject to the HMR.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:

This product is NOT classified as Dangerous Goods, per regulations of Transport Canada.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA): This product is NOT classified as dangerous goods under rules of IATA. (See A186, SP361)

INTERNATIONAL MARITIME ORGANIZATION (IMO) DESIGNATION: This product is NOT classified as Dangerous Goods by the International Maritime Organization. (See 36-12)

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR): This product is NOT classified by the United Nations Economic Commission for Europe to be dangerous goods, (see UN3499 SP 361):

AUSTRALIAN FEDERAL OFFICE OF ROAD SAFETY CODE FOR THE TRANSPORTATION OF DANGEROUS GOODS BY ROAD OR RAIL: This product is NOT classified as dangerous goods, per regulations of the Australian Federal Office of Road Safety.

15. Other Information

ADDITIONAL UNITED STATES REGULATIONS:

U.S. SARA Reporting Requirements: The components of this product are not subject to the reporting requirements of Sections 302, 304

and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows.

U.S. SARA Threshold Planning Quantity (TPQ): There are no specific Threshold Planning

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Quantities for the components of this product.

The default Federal SDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20. U.S. SARA Hazard Categories (Section 311/312, 40 CFR 370-21):

For Product as Manufactured: ACUTE: No; CHRONIC: No; FIRE: No; REACTIVE: No; SUDDEN RELEASE: No;

For Electrolyte Solution: ACUTE: Yes; CHRONIC: No; FIRE: No; REACTIVE: No; SUDDEN RELEASE: No

U.S. CERCLA Reportable Quantity (RQ): Not applicable.

U.S. TSCA Inventory Status: This is an article and is not subject to the requirements of TSCA.

Other U.S. Federal Regulations: This product meets the definition of an "Article" under the U.S. Federal OSHA Hazard Communication Standard (29 CFR 1910.1200). For further information, the definition of "Article" is provided below.

Article means a manufactured item other than a fluid or particle: (i) which is formed to a specific shape or design during manufacture; (ii) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and (iii) which under normal conditions of use does not release more than very small quantities, e.g., minute or trace amounts of a hazardous chemical, and does not pose a physical hazard or health risk to employees.

California Safe Drinking Water and Toxic Enforcement Act (Proposition 65): No component of this product is on the California Proposition 65 Lists.

ADDITIONAL CANADIAN REGULATIONS:

Canadian DSL Inventory: This is a manufactured item and is not subject to the DSL requirements under CEPA.

Other Canadian Regulations: This product meets the definition of an article under WHMIS Regulations (Hazardous Products Act, 6 & 7, Part II (Sections 11 and 12)).

Canadian Environmental Protection Agency (CEPA) Priorities Substances Lists: No component of this product is listed on the Priorities Substances Lists.

Canadian WHMIS Classification and Symbols: Not applicable for articles.

ADDITIONAL EUROPEAN REGULATIONS:

Safety, Health, and Environmental Regulations/Legislation Specific for the Product:

Requirements under the Waste Electrical and Electronic Equipment Directive (WEEE Directive), Directive 2002/96/EC, on Waste Electrical And Electronic (WEEE) which, together with the RoHS Directive 2002/95/EC may be applicable for wastes of this product.

Chemical Safety Assessment: No data available. The chemical safety assessment is required for some substances according to

European Union Regulation (EC) 1907/2006, Article 14.

ADDITIONAL AUSTRALIAN REGULATIONS:

Australian Inventory Of Chemical Substances (AICS) Status: The components of this product are listed on the AICS.

Hazardous Substances Information System (HSIS): The Propylene Carbonate component of this product is listed in the HSIS.

Standard for the Uniform Scheduling of Drugs and Poisons: Not applicable.

Labeling and Classification: This product does not meet the definition of any hazard class, based

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a review of the regulation [NOHSC: 10005 (1994)].

ADDITIONAL JAPANESE REGULATIONS:

Japanese Existing and New Chemical Substance List (ENCS) Status: As an article, this product is not subject to the requirements of the Japanese ENCS Inventory.

Japanese Minister of International Trade and Industry (MITI) Status: Not applicable.

Japanese Poisonous and Deleterious Substances Control Law: Not applicable.

Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof (MSDS required) (Effective from October 1, 2009): Boron compounds: 1-405

Air Pollution Control Law Hazardous Air Pollutants 221 of Central Environment Council 9th Report: Boron Compounds

Water Pollution Control Law Article 2-24 of Cabinet Order: Boron and Compounds: 10mg/L (B,Non-marine), 230mg/L(B,Marine)

Soil Contamination Countermeasures Act Article 1-23 of Cabinet Order: Boron and Compounds: Classification: Class 2; Soil

Leachate Standard: 1mg/L(B); Soil Concentration Standard: 4000mg/kg(B)

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