Report No.: E20131106D

# MSDS Report

Horizon Fuel Cell Technologies (Shanghai) Co. Ltd.
www.horizonfuelcell.com
Sample Description: HYDROSTIK PRO

## Material Safety Data Sheet (MSDS)

### Section 1 - Chemical Product and Company Identification

**Sample Name: Fuel Cell Cartridge HYDROSTIK PRO**
**Recommended Uses: N/A**
**Restrictions on use: N/A**
**Company Identification: Horizon Fuel Cell Technologies (Shanghai) Co. Ltd.**
**Address: 5th Floor, Building 19, No.2 Suide R.D. Shanghai.**
**Post Code: 200331**
**TEL: +86 13611934372 FAX: +86 21 52705064**
**E-Mail: jason@horizonfuelcell.com**
**Emergency Telephone: +86 13611934372**

### Section 2 - Hazards Identification

**EMERGENCY OVERVIEW**

**Physical and chemical hazards: This product contains an aluminum alloy materials enclosure and hydrogen which absorbed by a hydrogen storage alloy powder. Hydrogen is extremely flammable and may form explosive mixtures with air. Heating will cause rise in pressure with risk of containers bursting or explode. Hydrogen gas is lighter than air. Will mixes readily with air, and will replace oxygen in the air resulting in asphyxiation.**
**Human health hazards: The product should not be opened, disassembled, crushed, burned, or exposed to high temperatures. Under normal use and handling, the customer has no contact with the internal components of the product.**
**Environmental hazards: N/A**

**Specific hazards: N/A**
**UN Classification: 2.1**
**European Labeling in Accordance with EC Directives 1999/45/EC:**
**F+: Extremely flammable.**
**R 5: Heating may cause an explosion.**
**R 12: Extremely flammable.**
**S 2: Keep out of reach of children.**
**S 3/9: Keep in a cool, well-ventilated place.**
**S 15: Keep away from heat.**
**Important symptoms: See Section 11 for more information.**
**An outline of an anticipated emergency: In case of accident or if you feel unwell, seek medical advice immediately. See Section 4 for more information.**

## Section 3 - Composition, Information on Ingredients

**General Chemical Description: This chemical product is a mixture; contains an aluminum alloy materials enclosure and hydrogen which absorbed by a hydrogen storage alloy powder.**
**Composition, Information on Ingredients:**

| Chemical Name | | Percent (by weight) | CAS No. | EC# | EU Classification |
|---|---|---|---|---|---|
| Hydrogen storage alloy powder | Ti | 19.80% | 7440-32-6 | 231-142-3 | None |
| | Mn | 31.60% | 7439-96-5 | 231-105-1 | None |
| | Fe | 5.59% | 7439-89-6 | 231-096-4 | None |
| | Zr | 5.39% | 7440-67-7 | 231-176-9 | F:R 15-17 |
| | V | 5.62% | 7440-62-2 | 231-171-1 | None |
| Hydrogen (H2) | | 1% | 1333-74-0 | 215-605-7 | F+: R12 |
| Aluminum (Al) | | 32% | 7429-90-5 | 231-072-3 | For powder F: R 11-15 |

**Please refer to section 16 for an overview of all R-phrases mentioned here.**

## Section 4 - First Aid Measures

**Caution! No effect under routine handling and use. If exposure to internal materials within this product due to damaged outer metal casing, the following actions are recommended.**
**Inhalation: If inhaled, remove from exposure and move to fresh air immediately. Rinse mouth and nose with water. If breathing has ceased apply artificial respiration. Get medical aid if cough or other symptoms appear.**
**Skin: In case of contact, immediately flush skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing and shoes before reuse. Get medical aid if symptoms occur.**
**Eyes: Rinse immediately with plenty of water during at least 15-30 minutes, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses if easily possible. Get medical aid if symptoms occur.**
**Ingestion: Do not induce vomiting. If the injured is fully conscious: wash mouth out with water, then give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid if symptoms occur.**
**Most important acute and delayed symptoms/effects: See Section 11 for more information.**
**Protection of first-aiders: No action shall be taken involving any personal risk or without suitable training. Check oxygen content before entering confined area. If it is suspected that high concentrations $H_2$ gas is still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. Use proper personal protective equipment as indicated in Section 8.**
**Note To Physicians: Treat symptomatically and supportively.**

## Section 5 - Fire Fighting Measures

**Extinguishing Media: Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out; in other cases extinguish with water spray, powder, carbon dioxide. In case of fire: keep container cool by spraying with water. Combat fire from a sheltered position.**
**Explosive limits, vol% in air: Hydrogen: 4-76%.**
**Specific Hazards: This product contains an aluminum alloy materials enclosure and hydrogen which absorbed by a hydrogen storage alloy powder. Hydrogen is extremely flammable and may form explosive mixtures with air. Heating will cause rise in pressure with risk of containers bursting or explode. Hydrogen gas is lighter than air. Will**

**mixes readily with air, and will replace oxygen in the air resulting in asphyxiation.**
**Specific Extinguishing Methods: Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products. Move containers from fire area if this can be done without risk. Prevent run off from fire control dilution from entering streams or drinking water supply.**
**Protective Equipment: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear.**

## Section 6 - Accidental Release Measures

**Person-related Safety Precautions: No action shall be taken involving any personal risk or without suitable training. Evacuate and ventilate spill area. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Check oxygen content before entering confined area. Review Section 5 and Section 7 sections before proceeding with clean-up. Use proper personal protective equipment as indicated in Section 8.**
**Measures for Environmental Protection: Avoid dispersal of spilled material and runoff and contact with soil, water ways, drains and sewers.**
**Measures for Cleaning/Collecting: Remove all sources of ignition or heat. Stop leak if safe to do so. Move containers from spill area. Carefully collect undamaged product in a clean, dry and appropriate container for reuse or disposal. If the product leaks or spills, collect all released material in an appropriate container before proper disposal. Remove hydrogen gas with fine water spray. Consult an expert if hydrogen is spilled!**

## Section 7 - Handling and Storage

**General Information: This product should be stored, handled and used in accordance with good industrial hygiene practices and in conformity with any legal regulation. Before using, be sure reads and understands all safety instructions and other information contained in the operation instructions by manufacturer! Smoking should be prohibited in areas where this material is handled, stored and processed. Measure hydrogen concentrations with suitable gas detector (a normal**

**flammable gas detector is not suited for the purpose).**
**Handling: Training should be provided to anyone working with or near this material. Training should cover potential health effects and proper handling techniques. Ensure good local exhaust ventilation. Handle and open container with care. Secure product when using to protect from falling. Keep container tightly closed and away from incompatible substances (see section 10), any sources of ignition or heat (e.g. open flames, direct sunlight, hot surfaces, over heating). Keep out of reach of children. Empty containers retain product residue and can be dangerous. Do not try to open, repair, pressurize, cut, weld, braze, solder, drill, grind, or expose this product to heat, direct sunlight or open flames. The work area should be equipped with the corresponding species and quantity of fire equipment and leakage emergency equipment.**
**Storage: Check oxygen content before entering confined area. Do not enter storage areas and confined spaces unless adequately ventilated. Store in an original container. Keep container tightly closed when not in use. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. Keep away from incompatible substances (see section 10), any sources of ignition or heat (e.g. open flames, direct sunlight, hot surfaces, over heating). Keep out of reach of children. Inspect regularly for deficiencies such as damage or leaks. Treat carefully, avoid physical damage to containers. The product should be stored firmly secured to prevent falling or being knocked over. Full and empty product should be segregated. The storage area should be equipped with the corresponding species and quantity of fire equipment and leakage emergency equipment.**

## Section 8 - Exposure Controls, Personal Protection

**Exposure Limit:**

| CAS No. | ACGIH(mg/m3) | NIOSH(mg/m3) | OSHA(mg/m3) |
|---|---|---|---|
| 7440-32-6 | TLV-TWA 15 (astitanium oxide) | None listed | PEL-TWA 10 (astitanium oxide) |
| 7439-96-5 | TLV-TWA 0.2 | REL-TWA 1;REL-STEL 3 | None listed |
| 7440-47-3 | TLV-TWA 0.5 | REL-TWA 0.5 | PEL-TWA 1(as Cr) |
| 7440-67-7 | TLV-TWA 5;TLV-STEL 10 | REL-TWA 5;REL-STEL 10 | None listed |
| 7440-62-2 | None listed | None listed | None listed |
| 1333-74-0 | Hydrogen is considered as "Simple asphyxiant gases and vapors", and no exposure limits are listed for it. But oxygen levels should be maintained than 18 molar % at normal atmospheric pressure which is equivalent to a partial pressure of 135 mm Hg. | | |
| 7429-90-5 | TLV-TWA 10 (metal dust) | REL-TWA 10(total);REL-TWA 5 (respirable fraction) | PEL-TWA 15(total); PEL-TWA 5 (respirable fraction) |

**Engineering Controls: NO open flames, NO sparks, and NO smoking. Use a closed system, ventilation, explosion-proof electrical (ventilating, lighting and material handling) equipment. Measure hydrogen concentrations with suitable gas detector (a normal flammable gas detector is not suited for the purpose). Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels. The engineering controls also need to keep gas or vapor concentrations below any lower explosive limits. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.**

**Personal Protective Equipment:**

- **Respirators: Under normal condition of use and handing no special protection is required for sealed product. Use appropriate respirator if airborne dust or mist concentrations exceed.**
- **Hand Protection: Under normal condition of use and handing no special protection is required for sealed product.**
- **Eyes: Under normal condition of use and handing no special protection is required for sealed product.**

- **Skin and Body Protection: Under normal condition of use and handing no special protection is required for sealed product.**

**Personal Protective Equipment (In the Event of product Case Breakage): Always wear appropriate safety glasses with side shields or full face shield. Use appropriate gloves. Wear appropriate clothing. Use appropriate respirator.**

**Other Protection: Smoking should be prohibited in areas where this material is handled, stored and processed.**

## Section 9 - Physical and Chemical Properties

**Physical State: Cylindrical Solid.**
**Color: White and blue.**
**pH: N/A**
**Melting Point: N/A**
**Freezing Point: N/A**
**Boiling Point: N/A**
**Flash Point: N/A**
**Explosive limits, vol% in air: Hydrogen: 4-76%.**
**Vapor Pressure: N/A**
**Vapor Density (Air=1): N/A**
**Relative density (water = 1): N/A**
**Solubility: N/A**
**n-octanol/water partition coefficient as log Pow: N/A**
**Auto-ignition Temperature: N/A**
**Decomposition temperature: N/A**
**Odour threshold: N/A**
**Evaporation rate: N/A**
**Viscosity: N/A**

## Section 10 - Stability and Reactivity

**Chemical Stability: Stable at normal temperatures and pressures.**
**Possibility of hazardous reactions: Heating will cause rise in pressure with risk of containers bursting or explode.**
**Conditions to Avoid: Incompatible substances, any sources of ignition or heat (e.g. open flames, direct sunlight, hot surfaces, over heating).**
**Avoid physical damage to containers.**
**Incompatibilities with Other Materials: Conductive materials, strong oxidizers, strong acids and strong bases.**
**Hazardous Decomposition Products: Oxides of metal, metal fume,**

**hydrogen gas and etc.**

**Hazardous Polymerization: Will not occur.**

## Section 11 - Toxicological Information

**Toxicological Information:**

| CAS No. | RTECS# | LD50/LC50 |
|---|---|---|
| 7440-32-6 | XR1700000 | No data available |
| 7439-96-5 | OO9275000 | LD50:9 g/kg (Oral,rat) |
| 7440-47-3 | GB4200000 | No data available |
| 7440-67-7 | ZH7070000 | No data available |
| 7440-62-2 | YW1355000 | No data available |
| 1333-74-0 | MW8900000 | No data available |
| 7429-90-5 | BD0330000 | No data available |

**Skin irritation/corrosion: No date available.**

**Eye irritation/corrosion: No date available.**

**Respiratory or Skin sensitisation: No date available.**

**Reproductive Cell Mutagenicity: No date available.**

**Carcinogenicity:**

**Composition: CAS# 7440-32-6**

**- Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65.**

**Composition: CAS# 7439-96-5**

**- Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65.**

**Composition: CAS# 7440-47-3**

**- ACGIH: A4-Not classifiable as a human carcinogen.**

**- IARC: Group 3-Not classifiable as to carcinogenicity to humans.**

**- Not listed as a carcinogen by NTP, or CA Prop 65.**

**Composition: CAS# 7440-67-7**

**- ACGIH: A4-Not classifiable as a human carcinogen.**

**- Not listed as a carcinogen by IARC, NTP, or CA Prop 65.**

**Composition: CAS# 7440-62-2**

**- Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65.**

**Composition: CAS# 1333-74-0**

**- Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65.**

**Composition: CAS# 7429-90-5**

**- Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65.**

**Reproductive Toxicity: No date available.**

**Specific target organ toxicity-Single exposure: No date available.**
**Specific target organ toxicity-Repeated exposure: No date available.**
**Aspiration hazard: No date available.**
**Potential Health Effects:**

- **Inhalation: No effect under routine handling and use for sealed product. If product is broken, inhale fume and dust may cause respiratory irritation and lung irritation. If hydrogen is spilled, high concentrations hydrogen will replace oxygen in the air resulting in asphyxiation.**
- **Skin: No effect under routine handling and use for sealed product. Exposure to the material contained inside the product may cause irritation.**
- **Eye: No effect under routine handling and use for sealed product. Exposure to the material contained inside the product may result in irritation.**
- **Ingestion: No effect under routine handling and use for sealed product. May be harmful if swallowed the material contained inside the product.**

## Section 12 - Ecological Information

**Ecological Toxicity: Not available.**
**Persistence and degradability: Not available.**
**Bioaccumulative Potential: Not available.**
**Mobility in Soil: Not available.**
**Other adverse effects: Not available.**

## Section 13 - Disposal Considerations

**The generation of waste should be avoided or minimized wherever possible. Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Disposal should be in accordance with applicable regional, national and local laws and regulations.**
**Dispose of surplus and containers via a licensed waste disposal contractor. Do not try to open, repair, pressurize, cut, weld, braze, solder, drill, grind, or expose this product to heat, direct sunlight or open flames.**
**Refer to Section 7-Handling and Storage and Section 8-Exposure Controls/Personal Protection for additional handling information and protection of employees.**

## Section 14 - Transport Information

**UN 3468 – Division 2.1**

**The 54th revised edition of the UN Recommendations on the Transport of Dangerous Goods: Model Regulations (the "UN Model Regulations") currently provides for limited quantity exceptions for Fuel cell cartridge containing hydrogen in metal hydride, which are provided below for ease of reference:**

| UN# | Proper Shipping Name | Class | Volume |
|---|---|---|---|
| UN3468 | Hydrogen in metal hydride storage system or Hydrogen in a metal hydride contained in equipment or Hydrogen in metal hydride packed with equipment. | 2.1 | 22ml |

## Section 15 - Regulatory Information

**Regulatory Information: Reference to the local, national, US, EU, CA and international regulations.**

| CAS No. | TSCA | DFSL/NDSL | IECSC |
|---|---|---|---|
| 7440-32-6 | Listed | Listed in DSL | Listed |
| 7439-96-5 | Listed | Listed in DSL | Listed |
| 7440-47-3 | Listed | Listed in DSL | Listed |
| 7440-67-7 | Listed | Listed in DSL | Listed |
| 7440-62-2 | Listed | Listed in DSL | Listed |
| 1333-74-0 | Listed | Listed in DSL | Listed |
| 7429-90-5 | Listed | Listed in DSL | Listed |

## Section 16 - Additional Information

**Issue Time: 2013-11-06**
**Issue Department: Technical department**
**Data review unit:**
**Modification record:**
**Notice to reader**
**To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein.**
**Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.**
**List of all R phrases mentioned in the document:**
F+: Extremely flammable.
F: Highly flammable.
R 11: Highly flammable.
R 12: Extremely flammable.
R 15: Contact with water liberates extremely flammable gases.
R 17: Spontaneously flammable in air.

**Other Information:**
ACGIH:（American Conference of Governmental Industrial Hygienists）; CAS:（Chemical Abstracts Service）; DSL:（the Domestic Substances List of Canada）; EC:（European Commission）; EC50:（Median effective concentration）; IARC:（International Agency for Research on Cancer）;IATA:（International Air Transport Association）; IECSC:（Inventory of Existing Chemical Substances in China）;IMDG:（International Maritime Dangerous Goods）; KECI(KE-NO.):（Korea Existing Chemicals Inventory）; LC50:（Lethal concentration, 50 percent kill）;LD50:（Lethal dose, 50 percent kill）; NDSL:（the Non-domestic Substances List of Canada）; NIOSH:（US National Institute for Occupational Safety and Health）; NOEC: (No observed effect concentration）; NTP:（US National Toxicology Program）;OSHA:（US Occupational Safety and Health）; PC-STEL:（Permissible concentration-time weighted average）; PC-TWA: （Permissible concentration-short time exposure limit）;PEL: (Permissible Exposure Level); REL:（Recommended Exposure Limit）; RTECS: （Registry of Toxic Effects of Chemical Substances）; STEL:（Short Term Exposure Limit）; TDG:（Recommendations on the TRANSPORT OF DANGEROUS GOODS Model Regulations）; TSCA:（Toxic Substances Control Act of USA）;TWA:（Time Weighted Average）;TLV: （Threshold Limit Value）;