

# MATERIAL SAFETY DATA SHEET

**Product Name** : Li-ion battery pack, MicroRAE

**Applicant** : RAE Systems (Shanghai) Inc.

**Address** : No. 990 East Huiwang Road, Jiading District, Shanghai,  
China

**Signed by Shanghai Outao Testing Technology Service Co., Ltd**

**Written by** : 

**Date:** March 7<sup>th</sup>, 2016

## MATERIAL SAFETY DATA SHEET

### Section 1 – Chemical Product and Company Identification

|   |  |
|---|--|
| <b>Product name</b>                     | Li-ion battery pack, MicroRAE                                |
| <b>Type</b>                             | M03-3004-000   |
| <b>Manufacturer</b>                     | RAE Systems (Shanghai) Inc.                                  |
| <b>Address</b>                          | No. 990 East Huiwang Road, Jiading District, Shanghai, China |
| <b>Post Code</b>                        | 201815   |
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| <b>Information in case of emergency</b> |  |
| <b>Contact</b>                          | Zhang Jianfang   |
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### Section 2 – Hazards Identification

Do not short circuit, puncture, incinerate, crush, immerse, force discharge or expose to temperatures above the declared operating temperature range of the product. Risk of fire or explosion. The rechargeable lithium-ion batteries described in this Product Safety Data Sheet are sealed units which are not hazardous when used according to the recommendations of the manufacturer.

Under normal conditions of use, the electrode materials and liquid electrolyte they contain are not exposed to the outside, provided the battery integrity is maintained and seals remain intact. Risk of exposure only in case of abuse (mechanical, thermal, electrical) which leads to the activation of safety valves and/or the rupture of the battery container. Electrolyte leakage, electrode materials reaction with moisture/water or battery vent/explosion/fire may follow, depending upon the circumstances.

In the event that this battery has been ruptured, the electrolyte solution contained within the battery would be corrosive and can cause burns to skin and eyes.

#### Potential Health Effects

|                              |  |
|------------------------------|--|
| <b>Eye</b>                   | Contact between the battery and the eye will not cause any harm. Eye contact with contents of an open battery can cause severe irritation or burns to the eye.   |
| <b>Skin</b>                  | Contact between the battery and skin will not cause any harm. Skin contact with contents of an open battery can cause severe irritation or burns to the skin.  |
| <b>Ingestion</b>             | Swallowing of materials from a sealed battery is not an expected route of exposure. Swallowing the contents of an open battery can cause serious chemical burns of mouth, esophagus, and gastrointestinal tract. |
| <b>Inhalation</b>            | Inhalation of materials from a sealed battery is not an expected route of exposure. Vapors or mists from a ruptured battery may cause respiratory irritation.  |
| <b>Environmental effects</b> | Since a battery cell remains in the environment, do not throw out it into the environment.   |

### Section 3 – Composition/Information on Ingredient

| Composition            | CAS No.      | EINECS       | Molecular Formula | Weight % |
|------------------------|--------------|--------------|-------------------|----------|
| Battery cell           | Not assigned | Not assigned | Not assigned      | 41.5%    |
| Circuit board          | Not assigned | Not assigned | Not assigned      | 1.6%     |
| Black glue             | Not assigned | Not assigned | Not assigned      | 20.3%    |
| Battery pack enclosure | Not assigned | Not assigned | Not assigned      | 35.6%    |
| Wire                   | Not assigned | Not assigned | Not assigned      | 1%       |

### Section 4 – First Aid Measures

In the event of electrolyte leakage or escape of electrolyte:

|                                   |  |
|-----------------------------------|--|
| <b>Inhalation</b>                 | Remove victim to fresh air and keep at rest in a position comfortable for breathing.   |
|                                   | Get medical advice/attention if you feel unwell.   |
| <b>Skin contact</b>               | Remove/Take off immediately all contaminated clothing. Gently wash with plenty of soap and water. If skin irritation or burn occurs:               |
|                                   | Get medical advice/attention.  |
| <b>Eye contact</b>                | Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical advice/attention. |
| <b>Ingestion</b>                  | Get medical advice/attention. Rinse mouth.   |
| <b>Protection of first-aiders</b> | A rescuer should wear personal protective equipment, such as rubber gloves and airtight goggles.   |

### Section 5 – Fire Fighting Measures

|   |   |
|---|---|
| <b>Specific hazards</b>   | Lithium ion batteries contain flammable liquid electrolyte that may vent, ignite and produce sparks when subjected to high temperatures (> 150 °C), when damaged or abused (e.g., mechanical damage or electrical overcharge). Burning cells can ignite other batteries in close proximity.   |
| <b>Hazardous decomposition materials (under fire condition)</b> | Carbon monoxide, carbon dioxide, lithium oxides, hydrogen fluoride.   |
| <b>Suitable extinguishing media</b>                             | Dry chemical, foam, carbon dioxide, water   |
| <b>Specific methods</b>   | Fire-extinguishing work is done from the windward and the suitable fire-extinguishing method according to the surrounding situation is used. Uninvolved persons should evacuate to a safe place. In case of fire in the surroundings: Keep containers cool by spraying with water. Eliminate all ignition sources if safe to do so. |
| <b>Special protective equipment for firefighters</b>            | When extinguishing fire, be sure to wear personal protective equipment.   |

### Section 6 – Accidental Release Measures

Avoid contact with spilled or released material. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. See Chapter 13 for information on disposal. Observe the relevant local and international regulations

|   |   |
|---|---|
| <b>Personal precautions, protective equipment and emergency procedures:</b> | As an immediate precautionary measure, isolate spill or leak area for at least 25 meters in all directions. Keep unauthorized personnel away. Stay upwind. Keep out of low areas. |
|---|---|

|  |  |
|--|--|
| <b>Environmental precautions</b>                             | Ventilate closed areas before entering.<br>Wear adequate personal protective equipment as indicated in Section 8.  |
| <b>Methods and materials for containment and cleaning up</b> | Prevent material from contaminating soil and from entering sewers or waterways.<br>Stop the leak if safe to do so.<br>Absorb spilled material with an inert absorbent (dry sand or earth). Scoop contaminated absorbent into an acceptable waste container. Collect all contaminated absorbent and dispose of according to directions in Section 13. Scrub the area with detergent and water; collect all contaminated wash water for proper disposal. |
| <b>Prevention of secondary hazards</b>                       | Remove all sources of ignition.<br>Fire-extinguishing devices should be prepared in case of a fire.<br>Use spark-proof tools and explosion-proof equipment.  |

### Section 7 – Handling and Storage

|                 |  |
|-----------------|--|
| <b>Handling</b> | Do not open, disassemble, crush or burn battery. Do not expose cell to temperatures outside the range of -20°C to 50°C.  |
| <b>Storage</b>  | Store battery in a dry location. To minimize any adverse effects on battery performance it is recommended that the batteries be kept at room temperature (25°C +/- 5°C). Elevated temperatures can result in shortened cell life. Keep out of reach of children. |

### Section 8 – Exposure Controls, Personal Protection

|                                      |   |
|--------------------------------------|---|
| <b>Engineering controls</b>          | Airborne exposures to hazardous substances are not expected when product is used for its intended purpose.<br>Use local exhaust ventilation or other engineering controls to control sources of dust, mist, fume and vapor. |
| <b>Exposure limits</b>               | No data available   |
| <b>Personal protective equipment</b> |   |
| <b>Respiratory protection</b>        | Not necessary under normal conditions. Wear self-contained breathing apparatus (SCBA) if handling an open or leaking battery.   |
| <b>Hand protection</b>               | Not necessary under normal conditions. Wear neoprene or natural rubber gloves if handling an open or leaking battery.   |
| <b>Eye / Face protection</b>         | Not necessary under normal conditions. Wear safety glasses if handling an open or leaking battery.  |
| <b>Skin and body protection:</b>     | Not necessary under normal conditions. Wear protective clothing and boots if handling an open or leaking battery.   |

### Section 9 – Physical and Chemical Properties

|                                  |                   |
|----------------------------------|-------------------|
| <b>Physical appearance(20°C)</b> | Black solid       |
| <b>Odor</b>                      | Odorless          |
| <b>Odor threshold</b>            | No data available |
| <b>pH</b>                        | No data available |
| <b>Melting point/range</b>       | No data available |
| <b>Boiling point/range</b>       | No data available |
| <b>Flash Point</b>               | No data available |
| <b>Explosion Limits</b>          |                   |
| <b>Lower</b>                     | No data available |
| <b>Upper</b>                     | No data available |
| <b>Ignition Temperature</b>      | No data available |

|                 |                    |
|-----------------|--------------------|
| Vapour Pressure | No data available  |
| Vapour Density  | No data available  |
| Density         | No data available  |
| Solubility      | insoluble in water |

## Section 10 – Stability and Reactivity

|   |  |
|---|--|
| <b>Stability</b>                        | This product is stable under normal conditions.  |
| <b>Reactivity</b>                       | No special reactivity has been reported.   |
| <b>Conditions to avoid</b>              | Avoid exposing the battery to fire or temperatures above 80°C. Do not disassemble, crush, short or install with incorrect polarity. Avoid mechanical or electrical abuse.                                      |
| <b>Incompatible materials</b>           | Do not immerse in seawater or other high conductivity liquids, strong oxidizers.   |
| <b>Hazardous decomposition products</b> | This material may release toxic fumes if burned or exposed to fire. Breaching of the battery enclosure may lead to generation of hazardous fumes which may include extremely hazardous HF (hydrofluoric acid). |

## Section 11 – Toxicological Information

There is no available data for the product itself. The information for the internal cell materials are as follows:

|                              |  |
|------------------------------|--|
| <b>Acute Toxicity</b>        | Acute oral, dermal and inhalation toxicity data are not available for this article.  |
| <b>Other Toxicity Data</b>   | Risk of irritation occurs only if the battery is mechanically, thermally or electrically abused to the point of compromising the enclosure. If this occurs, irritation to the skin, eyes and respiratory tract may occur.  |
| <b>Corrosivity</b>           | No data available  |
| <b>Sensitization</b>         | No data available  |
| <b>Neurological Effects</b>  | No data available  |
| <b>Genetic Effects</b>       | No data available  |
| <b>Reproductive Effects</b>  | No data available  |
| <b>Developmental Effects</b> | No data available  |
| <b>Target Organ Effect</b>   | No data available  |
| <b>Carcinogenicity</b>       | Normal safe handling of this product will not result in exposure to substances that are considered human carcinogens by IARC (International Agency for Research on Cancer), ACGIH (American Conference of Governmental Industrial Hygienists, OSHA or NTP (National Toxicology Program). |

## Section 12 – Ecological Information

|  |                           |
|--|---------------------------|
| <b>Ecotoxicity</b>                     | No data available         |
| <b>Persistence/ degradability</b>      | Not readily biodegradable |
| <b>Bioaccumulative potential (BCF)</b> | No data available         |
| <b>Mobility in soil</b>                | No data available         |

## Section 13 – Disposal Considerations



|                              |  |
|------------------------------|--|
| <b>Waste Disposal Method</b> | Battery recycling is encouraged. Do NOT dump into any sewers, on the ground or into any body of water. Store material for disposal as indicated in Section 7 Handling and Storage.   |
| <b>USA</b>                   | Dispose of in accordance with local, state and federal laws and regulations.   |
| <b>Canada</b>                | Dispose of in accordance with local, provincial and federal laws and regulations.  |
| <b>EC</b>                    | Waste must be disposed of in accordance with relevant EC Directives and national, regional and local environmental control regulations. For disposal within the EC, the appropriate code according to the European Waste Catalogue (EWC) should be used. |

## Section 14 – Transport Information

Lithium-ion batteries are designed to comply with all applicable shipping regulations as prescribed by industry and legal standards which includes compliance with the UN Recommendations on the Transport of Dangerous Goods; IATA Dangerous Goods Regulations and applicable U.S. DOT regulations for the safe transport of lithium-ion batteries and the International Maritime Dangerous Goods Code. Each of the listed cells in Section 1 have passed the UN Manual of Tests and Criteria Part III Subsection 38.3, which is required by all of the directives listed above.

In the US, shipments of lithium ion batteries are classified as Class 9, UN3480, Packing Group II, by the U.S. Hazardous Materials Regulations (HMR). Packaging, markings and documentation requirements are defined in Title 49 of the Code of Federal Regulations (CFR), Section 173.185. of the U.S. HMR. Excepted cells and batteries are allowed to be transported within the US without Class 9 packaging and markings, but must conform to other requirements as stipulated in Special Provisions 188 and 189 in the 49 CFR Section 173.185 of the U.S. HMR.

International shipments of lithium ion cells and batteries are generally classified as Class 9, UN3480, Packing Group II, by the International Civil Aviation Organization (ICAO) and the International Maritime Dangerous Goods (IMDG) Code. Packaging, markings and documentation requirements are defined in the International Air Transport Association (IATA) Dangerous Goods Regulations (DGR) Packing Instructions 965 and Packing Instruction P903 of the IMDG Code.

Excepted cells and batteries are allowed to be transported internationally without Class 9 packaging and markings, but must conform to other requirements as stipulated in Packing Instructions 965 of the IATA DGR and Special Provision 188 under the IMDG Code.

## Section 15 – Regulatory Information

|   |  |
|---|--|
| <b>USA</b>  | All ingredients in the product are listed on the TSCA inventory.   |
| <b>EC Classification for the Substance/Preparation</b>    | This product is not classified as hazardous according to Regulation (EC) No. 1272/2008. Keep out of the reach of children. |
| <b>European/International Regulations</b>                 |  |
| <b>European Labeling in Accordance with EC Directives</b> |  |
| <b>Hazard Symbols:</b>                                    | Xi, N  |
| <b>Risk Phrases</b>                                       |  |
| R 20/22   | Harmful by inhalation and if swallowed   |
| R 52/53   | Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment                               |
| <b>Safety Phrases</b>                                     |  |
| S 16  | Keep away from sources of ignition - No smoking.   |
| S 24/25   | Avoid contact with skin and eyes   |
| S 60  | This material and/or its container must be disposed of as hazardous waste  |
| S 61  | Avoid release to the environment. Refer to special instructions / Safety data sheets                                       |

For details regulations you should contact the appropriate agency in your country.

## Section 16 – Additional Information

MSDS Creation Date: March 7<sup>th</sup>, 2016

This MSDS was prepared sincerely on the basis of the information we could obtained, however, any warranty shall not be given regarding the data contained and the assessment of hazards and toxicity. Prior to use, please investigate not only the hazards and toxicity information but also the laws and regulations of the organization, area and country where the products are to be used, which shall be given the first priority. Products are supposed to be used promptly after purchase in consideration of safety. Some new information or amendments may be added afterwards. If the products are to be used far behind the expected time of use or you have any questions, please feel free to contact us. The stated cautions are for normal handling only. In case of special handling, sufficient care should be taken, in addition to the safety measures suitable for the situation. All chemical products should be treated with the recognition of "having unknown hazards and toxicity", which differ greatly depending on the conditions and handling when in use and/or the conditions and duration of storage. The products must be handled only by those who are familiar with specialized knowledge and have experience or under the guidance of those specialists throughout use from opening to storage and disposal. Safe usage conditions shall be set up on each user's own responsibility.

### PRODUCT PHOTO



END OF REPORT