

# SAFETY DATA SHEET

according to OSHA HCS Hazcom 2012,  
Version 2.0  
Compilation Date 05/06/2017

## SECTION 1: Identification

### 1.1 Product identifiers

Product name: Zero-D perovskite, Cs<sub>4</sub>PbBr<sub>6</sub>, powder  
Product number: Zero-D Powder

### 1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Scientific research and development

### 1.3. Details of the supplier of the safety data sheet

Company: QUANTUM SOLUTIONS  
King Abdullah University of Science and  
Technology (KAUST), Thuwal 23955-6900,  
Kingdom of Saudi Arabia  
[www.quantum-solutions.com](http://www.quantum-solutions.com)  
[info@quantum-solutions.com](mailto:info@quantum-solutions.com)

Phone +966 56 302 3423

### 1.4 Emergency telephone number

Emergency phone: +966 56 302 3423 (Sunday to Thursday 08:00  
to 17:00 UTC+03:00)

Emergency Action: In the event of a medical enquiry involving this  
product, please contact your doctor or local  
hospital accident or emergency department  
and show this SDS.

## SECTION 2 Hazards identification

**2.1. Classification of the substance or mixture (GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)):**

Repr. 1A, Reproductive toxicity (Category 1A), H360

STOT RE 2, Specific target organ toxicity - repeated exposure (Category 2), H373

Acute Tox. 4, Acute Toxicity (Category 4), H302, H332

**2.2. GHS Label elements, including precautionary statements:**



**GHS07**

**GHS08**

– Signal word: Danger

Hazard statements

H302 + H332 - Harmful if swallowed or if inhaled

H360 - May damage fertility or the unborn child

H373 – May cause damage to organs through prolonged or repeated exposure

Precautionary statements

P201 - Obtain special instructions before use.

P202 - Do not handle until all safety precautions have been read and understood.

P233 - Keep container tightly closed.

P240 - Ground/bond container and receiving equipment.

P260 - Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.

P264 - Wash skin thoroughly after handling.

P271 - Use only outdoors or in a well-ventilated area.

P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection.

P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.



P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.

P304 + P340 + P312 - IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.

P308 + P313 - IF exposed or concerned: Get medical advice/ attention.

P331 - Do NOT induce vomiting.

P362 - Take off contaminated clothing and wash before reuse.

P405 - Store locked up.

P501 - Dispose of contents/ container to an approved waste disposal plant.

**2.3. Hazards not otherwise classified (HNOC) or not covered by GHS**

None

**SECTION 3 Composition/Information on ingredients**

**3.1. Substances:**

Zero-D Perovskite, Cs<sub>4</sub>PbBr<sub>6</sub>, powder:

Cesium Lead Bromide	Classification	Concentration
Synonyms: Cs <sub>4</sub> PbBr <sub>6</sub> CAS: no number	Repr. 1A (H360), Acute Tox. 4 (H332), STOT RE 2 (H373), Aquatic Acute 1 (H400), Aquatic Chronic 1 (H410)	100 %

**SECTION 4 First-aid measures**

**4.1. Description of first aid measures**

General advice	Immediately remove any clothing soiled by the product. Consult a doctor.
After inhalation	Supply fresh air. If required, provide artificial respiration. Consult a doctor.
After skin contact	Immediately rinse with water and wash skin with soap. Consult a doctor.
After eye contact	Rinse opened eye for several minutes under running water. Consult a doctor.



After swallowing

Rinse mouth with water. Do not induce vomiting.  
Immediately call a doctor.

#### **4.2. Most important symptoms and effects, both acute and delayed**

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

#### **4.3. Indication of any immediate medical attention and special treatment needed**

No data available

## **SECTION 5 Fire-fighting measures**

### **5.1 Extinguishing media**

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide

### **5.2. Special hazards arising from the substance or mixture**

No

### **5.3. Advice for firefighters**

Firefighting instructions

Cool tanks/drums with water spray/remove them into safety. Do not move the load if exposed to heat

Protection during firefighting

Use respiratory protective device compressed or air/oxygen apparatus

## **SECTION 6 Accidental release measures**

### **6.1. Personal precautions, protective equipment and emergency procedures:**

Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition.

### **6.2. Environmental precautions**

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

### **6.3. Methods and material for containment and cleaning up**



Contain spillage and then with an electrically protected vacuum cleaner or by wet-brushing or absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust) and place in container for disposal according to local regulations.

## **SECTION 7 Handling and storage**

### **7.1. Precautions for safe handling**

Avoid eye and skin contact. Avoid inhalation of vapour or mist. Keep away from sources of ignition. No smoking. Take measures to prevent the build up of electrostatic charge. Keep respiratory protective device available.

### **7.2. Conditions for safe storage, including any incompatibilities**

**Storage:** Keep container tightly closed in a dry and well-ventilated place

### **7.3. Specific end use(s)**

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## **SECTION 8 Exposure controls/personal protection**

### **8.1. Control parameters**

Components with workplace control parameters

### **8.2. Exposure controls**

Respiratory protection	Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU)
Hand protection	The selected protective gloves have to satisfy the specification of EU Directive 89/686/EEC and the standard EN 374 derived from it. Handle with gloves.
Eye protection	Safety glasses with side-shields conforming to NIOSH (US) or EN166 (EU)
Skin and body protection	Choose body protection according to the amount and concentration of the dangerous substance at the work place. Handle with gloves. Wash and dry hands. The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and standard EN 374 derived from it
Hygiene measures	Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday

## **SECTION 9 Physical and chemical properties**

### 9.1. Information on basic physical and chemical properties

Appearance	Form: Solid
	Colour: Green
Odour	No data available
Odour threshold	No data available
pH	No data available
Melting point	No data available
Boiling point	No data available
Flash point	No data available
Evaporation rate	No data available
Flammability (solid, gas)	No data available
Upper/lower flammability or explosive limits	No data available
Vapor pressure	No data available
Vapour density	No data available
Relative density	No data available
Solubility	Degrade in water, ethanol, and acetone. Dispersible in nonpolar solvents: hydrocarbons, halocarbons etc.
Partition coefficient: n-octanol/water	No data available
Auto-ignition temperature	No data available
Decomposition temperature	No data available
Viscosity	No data available
Explosive properties	No data available
Oxidizing properties	No data available

### 9.2 Other information

No data available

## SECTION 10 Stability and reactivity

### 10.1. Reactivity

No data available

### 10.2. Chemical stability

Stable under recommended storage conditions



### **10.3. Possibility of hazardous reactions**

No data available

### **10.4. Conditions to avoid**

No data available

### **10.5. Incompatible materials**

Strong oxidizing agents

### **10.6. Hazardous decomposition products:**

No data available.

## **SECTION 11 Toxicological information**

### **11.1. Information on toxicological effects**

Acute toxicity	No data available
Irritation	No data available
Corrosivity	No data available
Sensitisation	No data available
Repeated dose toxicity	Specific target organ toxicity - repeated exposure (Category 2)
Carcinogenicity	IARC (International Agency for Research on Cancer) – 2A NTP (National Toxicology Program) – R EPA (Environmental Protection Agency) – B2 TLV (Threshold Limit Value established by ACGIH) - A3 OSHA-Ca (Occupational Safety & Health Administration) - Substance is not listed
Mutagenicity	No data available
Toxicity for reproduction	Reproductive toxicity (Category 1A)

## **SECTION 12 Ecological information**

### **12.1. Toxicity**

Acute aquatic toxicity (Category 2)

Chronic aquatic toxicity (Category 3)

### **12.2. Persistence and degradability**



No data available

### **12.3. Bioaccumulative potential**

No data available

### **12.4. Mobility in soil**

No data available

### **12.5. Results of PBT and vPvB assessment**

No data available

### **12.6. Other adverse effects**

No data available

## **SECTION 13 Disposal considerations**

### **13.1. Waste treatment methods**

Must not be disposed of together with household garbage. Do not allow product to reach sewage system. Observe all federal, state, and local environmental regulations. Contact a licensed professional

## **SECTION 14 Transport information**

### **14.1. UN number**

DOT: 2291  
IMDG: 2291  
IATA: 2291

### **14.2 UN proper shipping name**

DOT: Lead compound, soluble, n.o.s. (Lead bromide)  
IMDG: Lead compound, soluble, n.o.s. (Lead bromide)  
IATA: Lead compound, soluble, n.o.s. (Lead bromide)

### **14.3 Transport hazard class(es)**

DOT: 6.1  
IMDG: 6.1  
IATA: 6.1

### **14.4 Packing group**

DOT: III  
IMDG: III  
IATA: III





**14.5 Environmental hazards**

DOT: No  
IMDG marine pollutant: Yes  
IATA: No

**14.6 Special precautions for user**

No data available

**14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code**

Not applicable

**SECTION 15 Regulatory information**

**15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture**

No data available

**15.2. Chemical safety assessment**

No data available

**SECTION 16 Other information**

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

**Preparation Information:**

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**QUANTUM SOLUTIONS**

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