



SAFETY DATA SHEET

according to OSHA HCS Hazcom 2012,
Version 1.0
Compilation Date 05/06/2016

SECTION 1: Identification

1.1 Product identifiers

Product name: Perovskite CsPbBr₃ Quantum Dots, solution in toluene

Product number: QD-P

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

Identified uses: Scientific research and product 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
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)):

Flam. Liq. 2, Flammable liquids (Category 2), H225

Skin Irrit. 2, Skin irritation (Category 2), H315

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

STOT SE 3, Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

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

Asp. Tox. 1, Aspiration hazard (Category 1), H304

2.2. GHS Label elements, including precautionary statements:



GHS02

GHS07

GHS08

– Signal word: Danger

Hazard statements

H225 - Highly flammable liquid and vapor

H304 - May be fatal if swallowed and enters airways

H315 – Causes skin irritation

H319 – Causes serious eye irritation

H336 - May cause drowsiness or dizziness

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.

P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

P233 - Keep container tightly closed.

P240 - Ground/bond container and receiving equipment.

P241 - Use explosion-proof electrical/ ventilating/ lighting/ equipment.

P242 - Use only non-sparking tools.

P243 - Take precautionary measures against static discharge.

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.

P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

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

P331 - Do NOT induce vomiting.

P332 + P313 - If skin irritation occurs: Get medical advice/ attention.

P337+P313 If eye irritation persists: Get medical advice/attention.

P362 - Take off contaminated clothing and wash before reuse.

P370 + P378 - In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.

P403 + P233 - Store in a well-ventilated place. Keep container tightly closed.

P403 + P235 - Store in a well-ventilated place. Keep cool.

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

3.2. Mixtures:

Perovskite Quantum Dots in toluene:

Cesium Lead Bromide	Classification	Concentration
Synonyms: CsPbBr ₃ CAS: 15243-48-8	Repr. 1A (H360), Acute Tox. 4 (H332), STOT RE 2 (H373), Aquatic Acute 1 (H400), Aquatic Chronic 1 (H410)	≥ 0 - < 5 %
Toluene	Classification	Concentration
Synonyms: benzyl hydride, methylbenzene, phenylmethane, toluol, toluol oil, toluole. CAS: 108-88-3	Flam. Liq. 2 (H225), Repr. 2 (H361), Asp. Tox. 1 (H304), STOT RE 2 (H373), Skin Irrit. 2 (H315), STOT SE 3 (H336)	≥ 95 - < 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	Preferably: alcohol resistant foam. Water spray. BC powder. Polyvalent foam. AFFF foam. Carbon dioxide.
Unsuitable extinguishing media	Container may slop over if solid jet (water/foam) is applied.

5.2. Special hazards arising from the substance or mixture

Fire hazard	DIRECT FIRE HAZARD. Highly flammable. Gas/vapour flammable with air within explosion limits. INDIRECT FIRE HAZARD. May build up electrostatic charges: risk of ignition. May be ignited by sparks. Gas/vapour spreads at floor level: ignition hazard. Reactions involving a fire hazard: see "Reactivity Hazard"
Explosion hazard	DIRECT EXPLOSION HAZARD. Gas/vapour explosive with air within explosion limits. INDIRECT EXPLOSION HAZARD. may be ignited by sparks. Reactions with explosion hazards: see "Reactivity Hazard"
Reactivity	Upon combustion: CO and CO ₂ are formed. Reacts violently with (some) halogens. Reacts violently with (strong) oxidizers: (increased) risk of fire/explosion. Violent to explosive reaction with (some) acids

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: Store in cool place. Keep container tightly closed in a dry and well-ventilated place. Recommended storage temperature 2-25 °C. Protect from heat and direct sunlight.

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: Liquid Color: green
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Odour	Unpleasant
Odour threshold	No data available
pH	No data available
Melting point	-95 °C (toluene)
Boiling point	110 °C (toluene)
Flash point	4 °C (toluene)
Evaporation rate	No data available
Flammability (solid, gas)	No data available
Upper/lower flammability or explosive limits	Upper explosion limit: 7 Vol % (toluene) Lower explosion limit: 1.2 Vol % (toluene)
Vapor pressure	29.1 hPa (21.8 mmHg) at 20 °C (toluene)
Vapour density	No data available
Relative density	0.865 g/cm ³
Solubility	Soluble in nonpolar solvents
Partition coefficient: n-octanol/water	No data available
Auto-ignition temperature	535 °C (toluene)
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

Vapours may form explosive mixture with air.

10.4. Conditions to avoid

Heat, flames and sparks. Extremes of temperature and direct sunlight.

10.5. Incompatible materials

Strong oxidizing agents, Strong bases

10.6. Hazardous decomposition products:

No data available.

SECTION 11 Toxicological information

11.1. Information on toxicological effects

Acute toxicity	No data available
Irritation	Skin irritation (Category 2)
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: 1294 IMDG: 1294 IATA: 1294
14.2 UN proper shipping name	DOT: Toluene, solution IMDG: Toluene, solution IATA: Toluene, solution
14.3 Transport hazard class(es)	DOT: 3 IMDG: 3 IATA: 3
14.4 Packing group	DOT: II IMDG: II IATA: II
14.5 Environmental hazards	DOT: No IMDG marine pollutant: No 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

HMIS Rating

Health hazard: 2

Flammability: 3

Physical Hazard 0

NFPA Rating

Health hazard: 2

Health Hazard: 2

Fire Hazard: 3

Reactivity Hazard: 0

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:

Version 1.0

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