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**SECTION 1: IDENTIFICATION OF THE PRODUCT AND OF THE COMPANY**

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**1.1 Product identifiers**

Product Name : ACS Material Oil Dispersible Upconverting Nanoparticles  
Brand : ACS Material LLC  
CAS-No. : 110-82-7 (Cyclohexane), 7681-49-4(Sodium fluoride)

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

Identified uses : Laboratory chemicals, Manufacturing of substances

**1.3 Details of the supplier of the safety data sheet**

Company : ACS MATERIAL LLC  
959 E Walnut St., Suite 100  
Pasadena, CA 91106  
USA

Telephone : +1 (866)-227-0656

Fax : +1 (781)-518-0284

**1.4 Emergency telephone number**

Emergency Phone #: +1 (866)-227-0656

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**SECTION 2: HAZARDS IDENTIFICATION**

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**2.1 Classification of the substance or mixture****GHS Classification**

Flammable liquids (Category 2)

Acute toxicity, Oral (Category 2)

Acute toxicity, Dermal (Category 5)

Skin corrosion/irritation (Category 2, Category 3)

Serious eye damage/eye irritation (Category 2A, Category 2B)

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

Aspiration hazard (Category 1)

Acute aquatic toxicity (Category 1, Category 3)

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

Pictogram



Signal word Danger

Hazard statement(s)

H225 Highly flammable liquid and vapour.

H300 Fatal if swallowed.



H304	May be fatal if swallowed and enters airways.
H313	May be harmful in contact with skin.
H315	Causes skin irritation.
H316	Causes mild skin irritation.
H319	Causes serious eye irritation.
H320	Causes eye irritation.
H335	May cause respiratory irritation.
H336	May cause drowsiness or dizziness.
H400	Very toxic to aquatic life.
H402	Harmful to aquatic life.

## Precautionary statement(s)

P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear eye protection/ face protection. Wear protective gloves.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P302 + P352	IF ON SKIN: Wash with plenty of water.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
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.
P405	Store locked up.
P422	Store contents under inert gas.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

Damage to the lungs, kidney, heart, bone, gastrointestinal tract, teeth, central nervous system.

**SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS****3.1 Substances**

Substance name	:	ACS Material Oil Dispersible Upconverting Nanoparticles
Formula	:	NaYREF <sub>4</sub> (RE: Yb, Er, Tm, Gd, Mn, Lu)
Substance	:	Cyclohexane
CAS-No.	:	110-82-7
EC-No.	:	203-806-2
Molecular weight	:	84.16 g/mol
Formula	:	C <sub>6</sub> H <sub>12</sub>

Substance : Sodium fluoride  
CAS-No. : 7681-49-4  
EC-No. : 231-667-8  
Molecular weight : 41.99 g/mol  
Formula : NaF

### Hazardous components

Component	Concentration	CAS-No.
Cyclohexane	99.5 wt %	110-82-7
Sodium fluoride	< 0.5 wt %	7681-49-4
Yttrium	< 0.5 wt %	7440-65-5
Ytterbium	< 0.5 wt %	7440-64-4
Erbium	< 0.5 wt %	7440-52-0
Thulium	< 0.5 wt %	7440-30-4
Gadolinium	< 0.5 wt %	7440-54-2
Manganese	< 0.5 wt %	7439-96-5
Lutetium	< 0.5 wt %	7439-94-3

For the full text of the phrases mentioned in this Section, see Section 16.

**Hazardous impurities:** None known.

## SECTION 4: FIRST AID MEASURES

### 4.1 Description of first aid measures

#### General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

#### If inhaled

If inhaled, remove to fresh air. If not breathing, give artificial respiration. Get medical attention.

#### In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. First treatment with calcium gluconate paste. Consult a physician.

#### In case of eye contact

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes.

#### If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

### 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: FIREFIGHTING MEASURES

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### 5.1 Extinguishing media

Use alcohol-resistant foam, dry chemical, carbon dioxide or dry sand.

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

No data available.

### 5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

### 5.4 Hazardous combustion products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, hydrogen fluoride, sodium oxides, yttrium oxides, ytterbium oxides, erbium oxides, gadolinium oxides, manganese/manganese oxides.

### 5.5 Conditions of flammability

Flammable in the presence of a source of ignition when the temperature is above the flash point. Keep away from heat/sparks/open flame/hot surface. No smoking.

### 5.6 Further information

Use water spray to cool unopened containers.

## SECTION 6: ACCIDENTAL RELEASE MEASURES

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### 6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

### 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 materials for containment and cleaning up

Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing. Sweep up and shovel. Do not flush with water. Place in container for disposal according to local regulations (see section 13).

### 6.4 Reference to other sections

For disposal see section 13.

## SECTION 7: HANDLING AND STORAGE

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### 7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take

measures to prevent the build-up of electrostatic charge.  
For precautions see section 2.2.

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

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Never allow product to get in contact with water during storage. Store under inert gas.

**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**

Components	CAS-No.	Value	Control Parameters	Basis
Cyclohexane	110-82-7	TWA	100.000000 ppm 344.000000 mg/m <sup>3</sup>	Canada. Alberta, Occupational Health and Safety Code (table 2: OEL)
		TWA	100.000000 ppm	Canada. British Columbia OEL
		TWAEV	300.000000 ppm 1,030.000000 mg/m <sup>3</sup>	Québec. Regulation respecting occupational health and safety, Schedule 1, Part 1: Permissible exposure values for airborne contaminants
Sodium fluoride	7681-49-4	TWA	100.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		TWA	2.500000 mg/m <sup>3</sup>	Canada. Alberta, Occupational Health and Safety Code (table 2: OEL)
		TWAEV	2.500000 mg/m <sup>3</sup>	Canada. Ontario OELs
		TWA	2.500000 mg/m <sup>3</sup>	Canada. British Columbia OEL
		TWA	2.500000 mg/m <sup>3</sup>	Québec. Regulation respecting occupational health and safety, Schedule 1, Part 1: Permissible exposure values for airborne contaminants
		TWAEV	2.5 mg/m <sup>3</sup>	Québec. Regulation respecting occupational health and safety, Schedule 1, Part 1: Permissible

				exposure values for airborne contaminants
		TWA	2.500000 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
Yttrium	7440-65-5	TWA	1 mg/m <sup>3</sup>	Canada. Alberta, Occupational Health and Safety Code (table 2: OEL)
		TWA	1 mg/m <sup>3</sup>	Canada. British Columbia OEL
		TWAEV	1 mg/m <sup>3</sup>	Canada. Ontario OELs
		TWAEV	1 mg/m <sup>3</sup>	Québec. Regulation respecting occupational health and safety, Schedule 1, Part 1: Permissible exposure values for airborne contaminants
		TWA	1 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
Manganese	7439-96-5	TWAEV	1.000000 mg/m <sup>3</sup>	Québec. Regulation respecting occupational health and safety, Schedule 1, Part 1: Permissible exposure values for airborne contaminants
		STEV	3.000000 mg/m <sup>3</sup>	Québec. Regulation respecting occupational health and safety, Schedule 1, Part 1: Permissible exposure values for airborne contaminants
		TWAEV	0.200000 mg/m <sup>3</sup>	Canada. Ontario OELs
		TWAEV	5 mg/m <sup>3</sup>	Québec. Regulation respecting occupational health and safety, Schedule 1, Part 1: Permissible exposure values for airborne contaminants
		TWA	0.200000 mg/m <sup>3</sup>	Canada. Alberta, Occupational Health and Safety Code (table 2: OEL)
		TWA	0.200000 mg/m <sup>3</sup>	Canada. British Columbia OEL
	Remarks	Adverse reproductive effect.		
		TWA	0.020000 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
		TWA	0.100000 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
		TWA	0.200000 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)



## 8.2 Exposure controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

### Appropriate engineering controls

Use mechanical exhaust or laboratory fumehood to avoid exposure. Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

### Personal protective equipment

#### Eye/face protection

Face shield and safety glasses. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

#### Hand protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

#### Skin and body protection

Use a complete suit protecting against chemicals. Flame retardant antistatic protective clothing recommended. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

#### Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

#### Control of environmental exposure

Do not let product enter drains.

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

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### 9.1 Information on basic physical and chemical properties

- |                    |  |
|--------------------|--|
| 1) Appearance      | Form: Dispersion                           |
|                    | Colour: yellowish or approaching colorless |
| 2) Odour           | Odourless                                  |
| 3) Odour Threshold | No data available                          |



4) pH	No data available
5) Melting point/freezing point	No data available
6) Initial boiling point and boiling range	No data available lit.
7) Flash point	-17.99 °C (-0.38 °F) – closed cup
8) Evaporation rate	No data available
9) Flammability	Highly combustible
10) Upper/lower flammability or explosive limits	No data available
11) Vapour pressure	No data available
12) Vapour density	No data available
13) Relative density	0.779 g/cm <sup>3</sup> at 25 °C (77 °F)
14) Water solubility	Practically insoluble
15) Partition coefficient: n- octanol/water	No data available
16) Auto-ignition temperature	No data available
17) Decomposition temperature	No data available
18) Viscosity	No data available
19) Explosive properties	No data available
20) Oxidizing properties	No data available

## 9.2 Other safety information

No data available.

## SECTION 10: STABILITY AND REACTIVITY

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### 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 acids, halogens, bases, phosphorus, sulphur oxides, peroxides.

### 10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, hydrogen fluoride, sodium oxides, ytterbium oxides, erbium oxides, gadolinium oxides, manganese/manganese oxides.

Other decomposition products - Gaseous hydrogen fluoride (HF).

In the event of fire: see section 5.



**SECTION 11: TOXICOLOGICAL INFORMATION****11.1 Information on toxicological effects****Acute toxicity**

LD50 Oral – Rat – 12,705 mg/kg

LC50 Inhalation – Rat – 4 h – 34,000 mg/l

LD50 Dermal – Rabbit - &gt; 2,000 mg/kg

Low toxicity.

**Skin corrosion/irritation**

Skin – Rabbit – 1548mg - 2days – skin irritation.

**Serious eye damage/eye irritation**

Eyes – Rabbit – Mild eye irritation.

**Respiratory or skin sensitisation**

No data available.

**Germ cell mutagenicity**

No data available.

**Carcinogenicity**

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

**Reproductive toxicity**

No data available.

**Specific target organ toxicity – single exposure**

Moderate skin irritant.

**Specific target organ toxicity – repeated exposure**

Rhythmic spasm of foot, anaesthesia, transient paresis, sialorrhoea, conjunctival irritation.

**Aspiration hazard**Inhalation – Rabbit – 65 g/m<sup>3</sup> – 6h/day – 2 weeks – 3/4 died.Inhalation – Rabbit – 44 g/m<sup>3</sup> – 6h/day – 2 weeks – 1/4 died.Inhalation – Rabbit – 32 g/m<sup>3</sup> – 6h/day – 5 weeks – 3/4 died.**Signs and Symptoms of Exposure**

Central nervous system depression, Drowsiness, Irritability, Dizziness, Gastrointestinal disturbance, Lung irritation, chest pain, pulmonary edema. Fluoride ion can reduce serum calcium levels possibly causing fatal hypocalcemia.

**Potential health effects**

**Inhalation** May be harmful if inhaled. May cause respiratory tract irritation.  
Vapours may cause drowsiness and dizziness.

**Ingestion** May be harmful if swallowed. Aspiration hazard if swallowed – can



	enter lungs and cause damage.
<b>Skin</b>	May be harmful if absorbed through skin. May cause skin irritation.
<b>Eyes</b>	May cause eye irritation.

**Additional Information**

RTECS: GU6300000(Cyclohexane).

**SECTION 12: ECOLOGICAL INFORMATION**

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**12.1 Toxicity**

Toxicity to fish	flow-through test LC50 – Pimephales promelas (fathead minnow) – 4.53 mg/l - 96 h Method: OECD Test Guideline 203
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 – Daphnia magna (Water flea) – 0.9 mg/l - 48 h Method: OECD Test Guideline 202
Toxicity to algae	EC50 – Pseudokirchneriella subcapitata (green algae) – 3.4 mg/l - 72 h Method: OECD Test Guideline 201

**12.2 Persistence and degradability**

Biodegradability Result: - Readily biodegradable.

**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**

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life.

**SECTION 13: DISPOSAL CONSIDERATIONS**

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**13.1 Waste treatment methods****Product**

Contact a licensed professional waste disposal service to dispose of this material. Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company.

**Contaminated packaging**

Dispose of as unused product.

**SECTION 14: TRANSPORT INFORMATION**

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**UN number**

DOT (US): 1145      IMDG: 1145      IATA: 1145

**UN proper shipping name**DOT (US): Cyclohexane.  
IMDG: CYCLOHEXANE.  
IATA: Cyclohexane.**Transport hazard class(es)**

DOT (US): 3      IMDG: 3      IATA: 3

**Packaging group**

DOT (US): II      IMDG: II      IATA: II

**Environmental hazards**

DOT (US): no      IMDG Marine pollutant: no      IATA: no

**Special precautions for user**

DOT (US): Reportable Quantity (RQ): 1000 lbs. Poison Inhalation Hazard: No

**SECTION 15: REGULATORY INFORMATION**

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

B2	Flammable liquid	Flammable liquid
D1B	Toxic Material Causing Immediate and Serious Toxic Effects	Toxic by ingestion
D2B	Toxic Material Causing Other Toxic Effects	Moderate skin irritant Moderate eye irritant
D2A	Very Toxic Material Causing Other Toxic Effects	Reproductive hazard

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations.

**SECTION 16: OTHER INFORMATION**

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**HMIS Classification**

Health hazard:	2
Chronic Health Hazard:	
Flammability:	3
Physical Hazard:	0

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