



Safety Data Sheet

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Material Type: Specialty polymer dissolved in isopropanol solution

Product Names: PV Efficiency Booster

SKU: SP23091

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

Identified uses: This innovative coating solution can boost the power conversion efficiency of most solar cells for extra 0.1%~0.15% (absolute value) when properly applied. The active materials can be readily applied via spray coating on the front side of most solar cells such as on the TCO glass side of perovskite solar cells, or on the TCO layer of perovskite-Si tandem cells, or on the front surface of metalized Si wafers (right before encapsulation).

1.3 Details of the supplier of the safety data sheet

Company:

Accurate Atom Inc.
1425 W. Lincoln HWY
DeKalb, Illinois, 60115
www.accurateatom.com
Tech@accurateatom.com

1.4 Emergency telephone number

Emergency Contact: Accurate Atom

Telephone: (630) 659-5999

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 2),
H225

Eye irritation (Category 2A), H319

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

2.2 GHS Label elements, including precautionary statements

Product Identifier: PV Efficiency Booster

Pictogram



Signal word Danger

Hazard statement(s)

H225 Highly flammable liquid and vapor.
H319 Causes serious eye irritation.
H336 May cause drowsiness or dizziness.

Precautionary statement(s)

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.
P261 Avoid breathing mist or vapors.
P264 Wash skin thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.
P280 Wear protective gloves/ eye protection/ face protection.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS – none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Hazardous Ingredients	Typical Composition	C.A.S. Number	EINECS/EC Label No.
isopropanol	>99%	67-63-0	200-661-7
Specialty Polymer	0.1– 1.0%	Trade secret	

4. FIRST AID MEASURES

4.1 Description of first aid measures

Show this material safety data sheet to the doctor in attendance.

If inhaled, After inhalation: fresh air. Call in physician.

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/shower.

In case of eye contact

After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed

After swallowing: immediately make victim drink water (two glasses at most). 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

5. FIREFIGHTING MEASURES

5.1 Suitable Extinguishing Media

Carbon dioxide (CO₂) Foam Dry powder

5.2 Special hazards arising from the substance or mixture

Pay attention to flashback.

Vapors are heavier than air and may spread along floors.

Development of hazardous combustion gases or vapours possible in the event of fire. Forms explosive mixtures with air at ambient temperatures.

Special Protective equipment for fire fighting

None needed. Wear protective equipment if required for other materials within immediate vicinity.

Further Information

Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition. Evacuate the danger area, observe emergency procedures, consult an expert. For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemisorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

Precautions for safe handling Advice on safe handling

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion

Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharge.

Hygiene measures

Change contaminated clothing. Wash hands after working with substance. For precautions see section 2.2.

Conditions for safe storage, including any incompatibilities Storage conditions

Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Storage class

Storage class (TRGS 510): 3: Flammable liquids

8.0 EXPOSURE CONTROLS / PERSONAL PROTECTION

Appropriate engineering controls

Change contaminated clothing. Wash hands after working with substance.

Personal protective equipment

Eye/face protection

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

Skin protection

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use.

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 480 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

Splash contact

Material: Chloroprene

Minimum layer thickness: 0.65 mm

Break through time: 120 min

Body Protection

Flame retardant antistatic protective clothing.

Respiratory protection

Recommended Filter type: Filter A (acc. to DIN 3181) for vapours of organic compounds

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

required when vapours/aerosols are generated. Our recommendations on filtering

respiratory protection are based on the following standards: DIN EN 143, DIN 14387

and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure

Do not let product enter drains. Risk of explosion.

9. PHYSICAL AND CHEMICAL PROPERTIES

Colorless Liquid at ambient temperatures

9.1 Information on basic physical and chemical properties

- a) Appearance/Form: liquid
- b) Color: colorless
- c) Odor: alcohol-like
- d) Odor Threshold: 1 ppm
- e) pH at 20 °C (68 °F) neutral
- f) Melting point/freezing point: Melting point: -89.5 °C (-129.1 °F)
- g) Initial boiling point and boiling range: 82.4 °C 180.3 °F at 1 atm
- h) Flash point 12.0 °C (53.6 °F) - closed cup
- i) Evaporation rate 3.0
- j) Flammability (solid, gas): no data available
- k) Upper/lower flammability or explosive limits:
Upper explosion limit: 13.4 %(V); Lower explosion limit: 2 %(V)
- l) Vapor pressure 43 hPa at 20 °C (68 °F)
- m) Vapor density 2.07
- n) Density 0.786 g/cm³ at 20 °C (68 °F)
- o) Water solubility: soluble
- p) Partition coefficient: n-octanol/water
- q) Autoignition temperature: 425.0 °C (797.0 °F)
- r) Decomposition temperature: Distillable in an undecomposed state at normal pressure.

10. STABILITY AND REACTIVITY

Reactivity

Formation of peroxides possible.

Vapors may form explosive mixture with air.

Chemical stability

Reacts with air to form peroxides.

The product is chemically stable under standard ambient conditions (room temperature).

Possibility of hazardous reactions

Risk of explosion with:

chlorates Phosgene

organic nitro compounds hydrogen peroxide perchlorates

strong oxidising agents Nitric acid

nitrogen dioxide Oxygen

Risk of ignition or formation of inflammable gases or vapours with: Alkali metals

Alkaline earth metals chromium(VI) oxide Exothermic reaction with: Aldehydes

Amines

fuming sulfuric acid Iron

Aluminum Chlorine Strong acids

halogen compounds potassium tert-butanolate

Conditions to avoid

Warming.

Incompatible materials

No data available

Hazardous decomposition products

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 5,840 mg/kg

(OECD Test Guideline 401)

LC50 Inhalation - Rat - male and female - 4 h - 37.5 mg/l - vapor

(OECD Test Guideline 403)

LD50 Dermal - Rabbit - 12,800 mg/kg Remarks: (RTECS)

Skin corrosion/irritation

Skin - Rabbit

Result: No skin irritation - 4 h (OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit Result: Eye irritation

(OECD Test Guideline 405)

Remarks: (Regulation (EC) No 1272/2008, Annex VI)

Respiratory or skin sensitization

Buehler Test - Guinea pig Result: negative
(OECD Test Guideline 406)

Germ cell mutagenicity

Test Type: Ames test

Test system: Salmonella typhimurium

Metabolic activation: with and without metabolic activation Method: OECD Test Guideline 471

Result: negative

Test Type: In vitro mammalian cell gene mutation test Test system: Chinese hamster ovary cells

Metabolic activation: with and without metabolic activation Method: OECD Test Guideline 476

Result: negative

Test Type: In vivo micronucleus test Species: Mouse

Cell type: Bone marrow

Application Route: Intraperitoneal injection Method: OECD Test Guideline 474

Result: negative

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

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

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

Inhalation, Oral - May cause drowsiness or dizziness. - Central nervous system Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish flow-through test LC50 - Pimephales promelas (fathead minnow) - 9,640 mg/l - 96 h (OECD Test Guideline 203)

Additional Information
No information available.

13. DISPOSAL CONSIDERATION

13.1 Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1219 Class: 3 Packing
group: II Proper shipping name: Isopropanol
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

15: Regulatory information

SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
2-Propanol	67-63-0	2007-03-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
2-Propanol	67-63-0	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2-Propanol	67-63-0	2007-03-01

Disclaimer This information is based upon the present state of our knowledge. This SDS has been compiled and is solely intended for this product.