

**SERAMIC™ BST**

Safety Data Sheet PP1-SEBS

Date of issue: 12/17/2015

Revision date: 01/09/2017

Version: 2.0

SECTION 1: Identification**1.1. Identification**

Product name	: SERAMIC™ BST
Product code	: PP1-SEBS
Product form	: Mixture
Physical state	: Liquid
Formula	: (RO)6Ba0.5Sr0.5Ti
Synonyms	: BARIUM STRONTIUM TITANIUM ALKOXIDE DOUBLE METAL ALKOXIDE/CARBOXYLATE OF BARIUM AND TITANIUM;
Chemical family	: METAL ALKOXIDE

1.2. Recommended use and restrictions on use

Recommended use	: Chemical intermediate
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1.3. Supplier**GELEST, INC.**11 East Steel Road
Morrisville, PA 19067**USA**

T 215-547-1015 - F 215-547-2484 - (M-F): 8:00 AM - 5:30 PM EST

info@gelest.com - www.gelest.com**1.4. Emergency telephone number**

Emergency number	: CHEMTREC: 1-800-424-9300 (USA); +1 703-527-3887 (International)
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SECTION 2: Hazard(s) identification**2.1. Classification of the substance or mixture****GHS-US classification**

Flammable liquids Category 3	H226	Flammable liquid and vapour
Skin corrosion/irritation Category 2	H315	Causes skin irritation
Serious eye damage/eye irritation Category 2A	H319	Causes serious eye irritation
Specific target organ toxicity (single exposure) Category 3	H335	May cause respiratory irritation
Specific target organ toxicity (single exposure) Category 3	H336	May cause drowsiness or dizziness

Full text of H statements : see section 16

2.2. GHS Label elements, including precautionary statements**GHS-US labeling**

Hazard pictograms (GHS-US)



Signal word (GHS-US)

: Warning

Hazard statements (GHS-US)

: H226 - Flammable liquid and vapour
H315 - Causes skin irritation
H319 - Causes serious eye irritation
H335 - May cause respiratory irritation
H336 - May cause drowsiness or dizziness

Precautionary statements (GHS-US)

: P280 - Wear protective gloves/protective clothing/eye protection/face protection.
P312 - Call a doctor if you feel unwell
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. heat, open flames, sparks
P233 - Keep container tightly closed.
P240 - Ground/Bond container and receiving equipment
P241 - Use explosion-proof electrical equipment
P242 - Use only non-sparking tools.
P243 - Take precautionary measures against static discharge.

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P261 - Avoid breathing vapors.
P264 - Wash hands thoroughly after handling.
P271 - Use only outdoors or in a well-ventilated area.
P303+P361+P353 - If on skin (or hair): take off immediately all contaminated clothing. rinse skin with water/shower
P332+P313 - If skin irritation occurs: Get medical advice/attention.
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337+P313 - If eye irritation persists: Get medical advice/attention.
P321 - Specific treatment (see first aid instructions on this label)
P362+P364 - Take off contaminated clothing and wash it before reuse.
P370+P378 - In case of fire: Use water spray, foam, carbon dioxide, dry chemical to extinguish.
P403+P233 - Store in a well-ventilated place. Keep container tightly closed.
P403+P235 - Keep in a cool place
P405 - Store locked up.
P501 - Dispose of contents/container to licensed waste disposal facility.

2.3. Hazards not otherwise classified (HNOC)

No additional information available

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substances

Not applicable

3.2. Mixtures

Name	Product identifier	%	GHS-US classification
Methoxypropanol	(CAS-No.) 107-98-2	> 70	Flam. Liq. 3, H226 Eye Irrit. 2A, H319 STOT SE 3, H336
n-Butanol	(CAS-No.) 71-36-3	< 25	Flam. Liq. 3, H226 Acute Tox. 4 (Oral), H302 Skin Irrit. 2, H315 Eye Irrit. 2A, H319 STOT SE 3, H335
Barium*	(CAS-No.) Trade Secret	3.3 - 3.5	Not classified
Titanium*	(CAS-No.) Trade Secret	2.3 - 2.5	Not classified
Strontium *	(CAS-No.) Trade Secret	2.1 - 2.2	Not classified

*Chemical name, CAS number and/or exact concentration have been withheld as a trade secret

Full text of hazard classes and H-statements : see section 16

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures general : Remove contaminated clothing and shoes. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). If possible show this sheet; if not available show packaging or label.

First-aid measures after inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If you feel unwell, seek medical advice.

First-aid measures after skin contact : Wash with plenty of soap and water. Get medical advice/attention.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical advice/attention.

First-aid measures after ingestion : Never give anything by mouth to an unconscious person. Get medical advice/attention.

4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects after inhalation : May cause drowsiness or dizziness. May cause respiratory irritation.

Symptoms/effects after skin contact : Causes skin irritation.

Symptoms/effects after eye contact : Causes serious eye irritation.

Symptoms/effects after ingestion : May be harmful if swallowed.

4.3. Immediate medical attention and special treatment, if necessary

No additional information available

SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media : Water spray. Foam. Carbon dioxide. Dry chemical.

Unsuitable extinguishing media : Do not use straight streams.

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5.2. Specific hazards arising from the chemical

- Fire hazard : Flammable liquid and vapour. Irritating fumes and organic acid vapors may develop when material is exposed to elevated temperatures or open flame.
- Explosion hazard : May form flammable/explosive vapor-air mixture.

5.3. Special protective equipment and precautions for fire-fighters

- Firefighting instructions : Exercise caution when fighting any chemical fire. Use water spray to cool exposed surfaces.
- Protection during firefighting : Do not enter fire area without proper protective equipment, including respiratory protection. Avoid all eye and skin contact and do not breathe vapor and mist.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

- General measures : Eliminate every possible source of ignition. Use special care to avoid static electric charges.

6.1.1. For non-emergency personnel

- Protective equipment : Wear protective equipment as described in Section 8.
- Emergency procedures : Evacuate unnecessary personnel.

6.1.2. For emergency responders

- Protective equipment : For further information refer to section 8: "Exposure controls/personal protection". Equip cleanup crew with proper protection. Do not attempt to take action without suitable protective equipment.

6.2. Environmental precautions

- Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

- For containment : Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams.
- Methods for cleaning up : Clean up any spills as soon as possible, using an absorbent material to collect it. Sweep or shovel spills into appropriate container for disposal. Use only non-sparking tools.

6.4. Reference to other sections

- See Heading 8. Exposure controls and personal protection.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

- Additional hazards when processed : Handle empty containers with care because residual vapors are flammable. Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
- Precautions for safe handling : Avoid all eye and skin contact and do not breathe vapor and mist. Ground/bond container and receiving equipment. Take precautionary measures against static discharge. Use only outdoors or in a well-ventilated area. Use only non-sparking tools.
- Hygiene measures : Wash contaminated clothing before reuse. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work.

7.2. Conditions for safe storage, including any incompatibilities

- Technical measures : Proper grounding procedures to avoid static electricity should be followed. Use explosion-proof electrical equipment.
- Storage conditions : Keep container tightly closed. Keep in a cool place. Store locked up.
- Incompatible materials : Oxidizing agent. Water.
- Storage area : Store in a well-ventilated place. Store away from heat.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Methoxypropanol (107-98-2)		
ACGIH	ACGIH TWA (ppm)	50 ppm
ACGIH	ACGIH STEL (ppm)	100 ppm
NIOSH	NIOSH REL (TWA) (mg/m ³)	360 mg/m ³
NIOSH	NIOSH REL (TWA) (ppm)	100 ppm
NIOSH	NIOSH REL (STEL) (mg/m ³)	540 mg/m ³
NIOSH	NIOSH REL (STEL) (ppm)	150 ppm
n-Butanol (71-36-3)		
ACGIH	ACGIH TWA (ppm)	20 ppm
OSHA	OSHA PEL (TWA) (mg/m ³)	300 mg/m ³

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n-Butanol (71-36-3)		
OSHA	OSHA PEL (TWA) (ppm)	100 ppm
IDLH	US IDLH (ppm)	1400 ppm (10% LEL)
NIOSH	NIOSH REL (ceiling) (mg/m ³)	150 mg/m ³
NIOSH	NIOSH REL (ceiling) (ppm)	50 ppm

8.2. Appropriate engineering controls

Appropriate engineering controls : Provide local exhaust or general room ventilation.

8.3. Individual protection measures/Personal protective equipment

Personal protective equipment:

Avoid all unnecessary exposure. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Hand protection:

Neoprene or nitrile rubber gloves

Eye protection:

Chemical goggles. Contact lenses should not be worn

Skin and body protection:

Wear suitable protective clothing

Respiratory protection:

Where exposure through inhalation may occur from use, respiratory protection equipment is recommended. NIOSH-certified organic vapor (black cartridge) respirator.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	: Liquid
Appearance	: Liquid.
Color	: Straw to dark.
Odor	: Mild.
Odor threshold	: No data available
Refractive index	: No data available
pH	: No data available
Relative evaporation rate (butyl acetate=1)	: No data available
Melting point	: No data available
Freezing point	: < 0 °C
Boiling point	: 117 °C initial
Flash point	: 39 °C
Auto-ignition temperature	: 365 °C (n-butanol)
Decomposition temperature	: No data available
Flammability (solid, gas)	: Flammable liquid and vapour
Vapor pressure	: No data available
Relative vapor density at 20 °C	: > 1
Relative density	: 1 - 1.01
% Volatiles	: > 25 %
Solubility	: Reacts with water.
Log Pow	: No data available
Log Kow	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: No data available
Explosive properties	: No data available
Oxidizing properties	: No data available
Explosion limits	: No data available

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9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

Stable in sealed containers.

10.3. Possibility of hazardous reactions

Moisture or water will slowly decompose product.

10.4. Conditions to avoid

Heat. Open flame. Sparks.

10.5. Incompatible materials

Oxidizing agent. Water.

10.6. Hazardous decomposition products

Barium oxides. Organic acid vapors. Strontium oxides. Titanium oxides.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Not classified

Methoxypropanol (107-98-2)	
LC50 inhalation rat (mg/l)	> 6 mg/l/4h
n-Butanol (71-36-3)	
LD50 oral rat	700 mg/kg
LD50 dermal rabbit	3402 mg/kg
LC50 inhalation rat (ppm)	> 8000 ppm/4h
ATE US (oral)	700 mg/kg body weight
ATE US (dermal)	3402 mg/kg body weight

Skin corrosion/irritation : Causes skin irritation.

Serious eye damage/irritation : Causes serious eye irritation.

Respiratory or skin sensitization : Not classified

Germ cell mutagenicity : Not classified

Carcinogenicity : Not classified

None of the components in this product at concentrations >0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

Reproductive toxicity : Not classified

Specific target organ toxicity – single exposure : May cause respiratory irritation. May cause drowsiness or dizziness.

Specific target organ toxicity – repeated exposure : Not classified

Aspiration hazard : Not classified

Symptoms/effects after inhalation : May cause drowsiness or dizziness. May cause respiratory irritation.

Symptoms/effects after skin contact : Causes skin irritation.

Symptoms/effects after eye contact : Causes serious eye irritation.

Symptoms/effects after ingestion : May be harmful if swallowed.

Reason for classification : Expert judgment

SECTION 12: Ecological information

12.1. Toxicity

Methoxypropanol (107-98-2)	
LC50 fish 1	20.8 g/l (Exposure time: 96 h - Species: Pimephales promelas [static])
EC50 Daphnia 1	23300 mg/l (Exposure time: 48 h - Species: Daphnia magna)
n-Butanol (71-36-3)	
LC50 fish 1	1730 - 1910 mg/l (Exposure time: 96 h - Species: Pimephales promelas [static])
EC50 Daphnia 1	1983 mg/l (Exposure time: 48 h - Species: Daphnia magna)

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n-Butanol (71-36-3)	
LC50 fish 2	1740 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])
EC50 Daphnia 2	1897 - 2072 mg/l (Exposure time: 48 h - Species: Daphnia magna [Static])

12.2. Persistence and degradability

No additional information available

12.3. Bioaccumulative potential

Methoxypropanol (107-98-2)	
BCF fish 1	< 2
Log Pow	-0.437

n-Butanol (71-36-3)	
BCF fish 1	0.64
Log Pow	0.785 (at 25 °C)

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

Effect on the ozone layer : No additional information available

SECTION 13: Disposal considerations

13.1. Disposal methods

Sewage disposal recommendations : Do not dispose of waste into sewer.
Product/Packaging disposal recommendations : Dispose in a safe manner in accordance with local/national regulations. Dispose of contents/container to licensed waste disposal facility.
Additional information : Handle empty containers with care because residual vapors are flammable.
Ecology - waste materials : Avoid release to the environment.

SECTION 14: Transport information

14.1. UN number

UN-No.(DOT) : 1139
DOT NA no. : UN1139

14.2. UN proper shipping name

Transport document description : UN1139 Coating solution (BARIUM STRONTIUM TITANIUM ALKOXIDE), 3, III
Proper Shipping Name (DOT) : Coating solution
(BARIUM STRONTIUM TITANIUM ALKOXIDE)
Class (DOT) : 3 - Class 3 - Flammable and combustible liquid 49 CFR 173.120
Packing group (DOT) : III - Minor Danger
Hazard labels (DOT) : 3 - Flammable liquid



DOT Packaging Non Bulk (49 CFR 173.xxx) : 203
DOT Packaging Bulk (49 CFR 173.xxx) : 242
DOT Packaging Exceptions (49 CFR 173.xxx) : 150

14.3. Additional information

Emergency Response Guide (ERG) Number : 127
Other information : No supplementary information available.

Transport by sea

DOT Vessel Stowage Location : A - The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel.

Air transport

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 60 L
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 220 L

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SECTION 15: Regulatory information

15.1. US Federal regulations

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TSCA Exemption/Exclusion

CAUTION: This material is supplied for research and development purposes subject to the R&D exemption under TSCA, 40 CFR 720.36, and must meet the requirements of the exemption, including supervision by a "technically qualified individual" as defined by 40 CFR 720.3(ee). The use of this material for "commercial purposes" as defined by 40 CFR 720.3(r) is not permitted in the United States.

Methoxypropanol (107-98-2)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

n-Butanol (71-36-3)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Subject to reporting requirements of United States SARA Section 313

EPA TSCA Regulatory Flag

T - T - indicates a substance that is the subject of a final TSCA section 4 test rule.
Y2 - Y2 - indicates a polymer that is a polyester and that was exempt under the 1984 polymer exemption rule. The polyester is made only from reactants included in a specified list of low-concern reactants that comprises one of the eligibility criteria for the 1984 polymer exemption rule.

SARA Section 313 - Emission Reporting

1 %

15.2. International regulations

CANADA

Methoxypropanol (107-98-2)

Listed on the Canadian DSL (Domestic Substances List)

WHMIS Classification

Class B Division 2 - Flammable Liquid

n-Butanol (71-36-3)

Listed on the Canadian DSL (Domestic Substances List)

WHMIS Classification

Class B Division 2 - Flammable Liquid
Class D Division 2 Subdivision B - Toxic material causing other toxic effects

EU-Regulations

Methoxypropanol (107-98-2)

Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

n-Butanol (71-36-3)

Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

National regulations

Methoxypropanol (107-98-2)

Listed on the AICS (Australian Inventory of Chemical Substances)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory
Listed on the Korean ECL (Existing Chemicals List)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
Listed on the Canadian IDL (Ingredient Disclosure List)
Listed on INSQ (Mexican National Inventory of Chemical Substances)
Listed on CICR (Turkish Inventory and Control of Chemicals)

n-Butanol (71-36-3)

Listed on the AICS (Australian Inventory of Chemical Substances)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory
Listed on the Japanese ISHL (Industrial Safety and Health Law)
Listed on the Korean ECL (Existing Chemicals List)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
Listed on the Canadian IDL (Ingredient Disclosure List)
Listed on INSQ (Mexican National Inventory of Chemical Substances)
Listed on CICR (Turkish Inventory and Control of Chemicals)

15.3. US State regulations

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Methoxypropanol (107-98-2)

U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List

n-Butanol (71-36-3)

U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List

SECTION 16: Other information

Full text of H-phrases::

H226	Flammable liquid and vapour
H302	Harmful if swallowed
H315	Causes skin irritation
H319	Causes serious eye irritation
H335	May cause respiratory irritation
H336	May cause drowsiness or dizziness

Abbreviations and acronyms

: Abbreviations: ND: Not Determined, No Data; NA: Not Applicable; LD: Lethal Dose; LC: Lethal Concentration; ATE: Acute Toxicity Estimates; H: hour; °: °C unless otherwise stated; mm: millimeters Hg, torr; PEL: permissible exposure level; TWA: time weighted average; TLV: threshold limit value; TG: Test Guideline; NIOSH: National Institute for Occupational Safety and Health; IARC: International Agency for Research on Cancer; NTP: National Toxicology Program; HMIS: Hazardous Material Information System; CAS No.: Chemical Abstract Service Registration Number; EC No.: European Commission Registration Number; EC Index No.: European Commission Index Number; OECD: The Organisation for Economic Co-operation and Development; GHS: The Globally Harmonized System of Classification and Labelling; APF: Assigned Protection Factor.

Hazard Rating

Health : 2 Moderate Hazard - Temporary or minor injury may occur
Flammability : 3 Serious Hazard - Materials capable of ignition under almost all normal temperature conditions. Includes flammable liquids with flash points below 73 F and boiling points above 100 F. as well as liquids with flash points between 73 F and 100 F. (Classes IB & IC)
Physical : 1 Slight Hazard - Materials that are normally stable but can become unstable (self-react) at high temperatures and pressures. Materials may react non-violently with water or undergo hazardous polymerization in the absence of inhibitors.

Prepared by safety and environmental affairs.

Date of issue: 12/17/2015 Revision date: 01/09/2017 Version: 2.0

SDS US (GHS HazCom 2012) - Custom

According to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

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Gelest Ceramic™ BST





High Dielectric Constant Barium Strontium Titanate Films

Features: Provide thermally resistant dielectric coatings by dip or spin-on application.

Applications:

Electronics - provides high dielectric constant layers for capacitors and electroluminescent applications.

Optics - provide overcoats for glass and quartz for index matching applications and as diffusion barriers.

Capsular Description:	Thickness	 thin	Cure	 thermal	Hardness	 high	Type	 solvent-borne 1-part
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Seramic™ BST Barium Strontium Titanate Precursor

Description

Seramic™ BST is mixed barium strontium and titanium double metal alkoxides in a solution of higher alcohols. Cure is two-stage, moisture followed by thermal.

Film Properties

color	clear
Metal Atom Ratio	0.5:0.5:1.0 Ba:Sr:Ti
refractive Index:	1.8-1.9

Solution Properties

form	amber solution
solids	36-40%
flashpoint:	39°C
density:	1.00g/cc
grams of BaSr _{0.5} Ti _{0.5} O ₃ per 100 grams sol'n	11.0-12.0

Shelf life: 6 months when stored below 5°C in sealed containers. Containers should be warmed to 15°C before opening to reduce condensation of water.

Standard Packaging

PP1-SEBS Ceramic™ BST
100g/ \$110.00
1kg/ \$660.00

Cautions

Use in a well ventilated area.
Flammable.
Avoid contact with skin and eyes:

Application Methods

Gelest Ceramic™ BST is applied as a coating by dipping or spin-on. After solvent evaporation at 40-60% RH, the system cures in 15 minutes at 650°C. As supplied, typical film deposition is 1200-1500 Å by spin-on application at 3000rpm. Thinner films may be prepared by diluting with methoxypropanol or diglyme.