

SAFETY DATA SHEET

Date Revised: 22/11/20 SECTION 1. IDENTIFICATION Product Name: Bismuth(III) Selenide CAS #: 12068-69-8 Relevant Identified uses of the substance: Scientific research and development Supplier details: Stanford Advanced Materials E-mail: sales@samaterials.com Tel: (949) 407-8904 Address: 23661 Birtcher Dr., Lake Forest, CA 92630 U.S.A. SECTION 2. HAZARDS IDENTIFICATION Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS) GHS06 Skull and crossbones Acute Tox. 3 H301 Toxic if swallowed. Acute Tox. 3 H301 Toxic if inhaled. GHS08 Health hazard STOT RE 2 H373 May cause damage to the central nervous system, the liver and the digestive system through prolonged or repeated e xposure. Route of exposure: Oral, Inhalative. Hazards not otherwise classified		н 1 — 1					11				Accesse	ed: 25/08	8/202
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No data available											
GHS label elements											
The product is classifie	d and la	abeled in									
accordance with 29 CF			,								
Hazard pictograms		1 1 1				: * *					
GHS06 GHS08Signal v	vord: Da	anger	1 - 1 1								
Hazard statements											
H301+H331 Toxic if sw	allowed						· .				
H373 May cause dama	ge to th	ne central	nervou	s syste	m, the live	er and th	he dige	stive syst	tem thro	ugh	
prolonged or repeated	exposu	re.			1 I						
Route of exposure: Ora	ıl,	н 1 — 1		, , ,							
Inhalative	1.			·			1. 1.			· .	
Precautionary statemer	nts										
P260 Do not breathe du	ust/fum	e/gas/mist	t/vapors	s/spray	-	: * *	1.			1.	
P261 Avoid breathing c	luct/fum	olaoc/mic	st/vanor	e/enra	N .						
F201 Avoid breathing d	iust/iuii	ie/yas/iiis	si vapoi	S/Spra	у.						
P304+P340 IF INHALE		-				it rest in	n a posi	ition comf	fortable	for	
	D: Rem	nove victin	n to free	sh air a	ind keep a		-				
P304+P340 IF INHALE	D: Rem	nove victin	n to free	sh air a	ind keep a		-				
P304+P340 IF INHALE breathing.	D: Rem	nove victin	n to fres	sh air a	ind keep a	1			1	14. 1	
P304+P340 IF INHALE breathing. P405 Store locked up. P403+P233 Store in a v P501 Dispose of conten	D: Rem well-ver nts/cont	nove victin ntilated pla tainer in a	n to fres ace. Ke ccordar	sh air a ep con nce wit	ind keep a tainer tigh h local/reg	tly close jional/na	ed. ational/	ínternatic	nal	14. 1	
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1 Health (acute ef	ifects) =	= 2		1	14		1	14. 14.		1		
Flammability = (: * *	· .	. :	1 1 1 1	1.	. :	;···					
Physical Hazard Other hazards	1 = 1	, , ,		: •	, , ,	. :						
Results of PBT a	and vP	vB asse	essment	1	1. 1.		1		, * * , * *	19 19	1.	.*
vPvB: N/A		<u>'</u>						1			1	

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

					,				
Substances									
CAS No. / Substance Name:			1. 1.		: • •	1. 1.		: • • • :	1. 1.
12068-69-8 Bismuth(III) selenio	de								
Identification number(s):	· · ·			1 1	,		1 I		
EC number: 235-104-7		1							14
Index number: 034-002-00-8									

SECTION 4. FIRST AID MEASURES

Description of first aid measures

General information

Immediately remove any clothing soiled by the product.

Remove breathing apparatus only after contaminated clothing has been completely removed.

In case of irregular breathing or respiratory arrest provide artificial respiration. If inhaled: Supply patient with fresh air. If not breathing, provide artificial respiration. Keep patient warm.

Seek immediate medical advice.

In case of skin contact:

Immediately wash with soap and water; rinse thoroughly.

			· · .			1.				
Seek immediate medical	advice.									
In case of eye contact:										
Rinse opened eye for se	veral minute	s under ru	unning \	water. Co	onsult a j	physicia	an.			. '
If swallowed:										
Do not induce vomiting; i	mmediately	call for m	edical h	elp.		· · .				
Information for doctor	.: .:	· · · ·		1 1 1	н н 1	1		н н н		
Most important symptom	s and effects	s, both ac	ute and	delayed		· .		· .		
No data available		ı		1	,	1	t.		,	
Indication of any immedia	ate medical	attention a	and spe	cial treat	ment ne	eded			· .	
No data available										
<u></u>										
SECTION 5. FIR Extinguishing media	_	_	_		_					
SECTION 5. FIR Extinguishing media Suitable extinguishing ag		_	Ч.,	, , ,						
Extinguishing media	gents	: ···	* 							
Extinguishing media Suitable extinguishing ag	gents e. Use fire-fig	Inting mea	asures t	hat suit t	the surro	ounding	fire.			
Extinguishing media Suitable extinguishing ag Product is not flammable	gents 9. Use fire-fig rom the sub	hting mea	asures t mixture	hat suit t	the surro	ounding	fire.			
Extinguishing media Suitable extinguishing ag Product is not flammable Special hazards arising f	gents 9. Use fire-fig 1 rom the sub 1 in a fire, the	hting mea stance or following	asures t mixture g can be	hat suit t e e release	the surro	ounding	fire.			
Extinguishing media Suitable extinguishing ag Product is not flammable Special hazards arising f If this product is involved Metal oxide fume	gents 9. Use fire-fig 1 rom the sub 1 in a fire, the	hting mea stance or following	asures t mixture g can be	hat suit t e release	the surro	ounding	fire.	:	14. 14.	
Extinguishing media Suitable extinguishing ag Product is not flammable Special hazards arising f If this product is involved Metal oxide fume Selenium dioxide (SeO2) Advice for firefighters	gents 9. Use fire-fig 1 rom the sub 1 in a fire, the	yhting mea stance or e following	asures t mixture g can be	hat suit t e released	the surro	ounding	fire.			
Extinguishing media Suitable extinguishing ag Product is not flammable Special hazards arising f If this product is involved Metal oxide fume Selenium dioxide (SeO2) Advice for firefighters	gents 9. Use fire-fig 1 rom the sub 1 in a fire, the	yhting mea stance or e following	asures t mixture g can be	hat suit t e released	the surro	ounding	fire.			
Extinguishing media Suitable extinguishing ag Product is not flammable Special hazards arising f If this product is involved Metal oxide fume Selenium dioxide (SeO2) Advice for firefighters	gents 9. Use fire-fig 1 rom the sub 1 in a fire, the	yhting mea stance or e following	asures t mixture g can be	hat suit t	the surro	ounding	fire.			

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Keep unprotected persons away.

Ensure adequate ventilation

Environmental precautions:		1 I 1			1 - 1 1		 		
Do not allow product to ente	er drains, se	wage s	ystems	, or othe	r water c	ourses			
Methods and materials for o	containment	and cle	eanup:			· · .			
Dispose of contaminated m			-						
Ensure adequate ventilation	n.		· .				 		
Prevention of secondary ha	zards:	н н н					 		
No special measures requir	red.								
Reference to other sections	3	i			i		Ĩ		
See Section 7 for information	on on safe h	andling	۰.						
See Section 8 for information	on on persor	nal prote	ection e			,			
See Section 13 for disposal	l information		, , ,				 		
						·		· .	
SECTION 7. HAN		AND	STO	RAG	E	14. 14.	 	÷.,	,
HandlingPrecautions for sa	fe handling						 		
Keep container tightly seale	ed.								
Store in cool, dry place in ti	ghtly closed	contain	ners.			14.			. '
Ensure good ventilation at t	he workplac	e.							
Open and handle container	with care.				111	11		14	
Information about protection	n against ex	plosion	s and fi	res:			 		
The product is not flammab	le								
Conditions for safe storage	, including a	ny incor	mpatibi	lities					
Requirements to be met by	storerooms	and rec	ceptacl	es:					
No special requirements.									
Information about storage in	n one comm	on stora	age fac	ility:	1 - 1 1		 		
Store away from oxidizing a	agents.	۰.	· .					· .	
Further information about s	torage cond	itions:	1			,			
Keep container tightly seale	ed.		۰,			· .		· .	
Store in cool, dry conditions	s in well-sea	led cont	tainers.						
Specific end use(s)	1	н н н	, , ,				 		

No	data	available	

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Additional information about design of technical systems: Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute. Control parameters Components with limit values that require monitoring at the workplace: None. Additional information: No data Exposure controls Personal protective equipment Follow typical protective and hygienic practices for handling chemicals. Keep away from foodstuffs, beverages and feed. Remove all soiled and contaminated clothing immediately. Wash hands before breaks and at the end of work. Store protective clothing separately. Maintain an ergonomically appropriate working environment. Breathing equipment: Use self-contained respiratory protective device in emergency situations. Recommended filter device for short term use: Use a respirator with type P100 (USA) or P3 (EN 143) cartridges as a backup to engineering controls. Risk assessment should be performed to determine if air-purifying respirators are appropriate. Only use equipment tested and approved under appropriate government standards. Protection of hands: Impervious gloves Inspect gloves prior to use. Suitability of gloves should be determined both by material and quality, the latter of which may vary

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by										 		
manut	facturer.											
Mater	ial of glov	res	11	. * *	1		. 11	1	14	 1		. * *
	rubber, N											
Penet	ration tim	e of glo	ve mate	erial (in r	ninutes)	14				 		
480												
Glove 0.11 n	thickness nm	S	1		1	14. 1		1		 1	14. 14.	
· · · · ·	rotection:		glasses	5	:	÷.,			1.	 : **	1.	
Body	protectior	n: Prote	ctive wo									

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical prope	rties		1.1.1					
Appearance:								
Form: Pieces or various forms		1 1	1					
Color: Grey						1	1. 1.	
Odor: No data available								
Odor threshold: No data available.	'		1.1.1	1. 1.		111		
pH: N/A			1 I					
Melting point/Melting range: 710 °C (1310 °F)								
Boiling point/Boiling range: No data available	· · .							. * *
Sublimation temperature / start: No data available	;							
Flammability (solid, gas): No data available.	· · .	1 1 1		1.	н н н	111		
Ignition temperature: No data available			1 I					
Decomposition temperature: No data available								
Autoignition: No data available.	'.			' .		1	' .	
Danger of explosion: No data available.								
Explosion limits:		1 I	-			-		
Lower: No data available		1 1 - 1	1					

							· · .				
Upper: No data availab	ble										
Vapor pressure: N/A											
Density at 20 °C (68 °F): 6.82	g/cm					14			1.	
3											
(56.913 lbs/gal)	· · .						11				
Relative density: No da	ata avail	able.				1 - 1 1					
Vapor density: N/A	•			· .			· · ·				
Evaporation rate: N/A							ı				1
Solubility in Water (H	· .			· .			1			· .	
2											
O): Insoluble						1 - 1 1		1 1			
Partition coefficient (n-	octanol/	water): N	No data	availab	le.		1. 1.		1	1. 1.	
Viscosity:											
Dynamic: N/A	1. 1.			1.		; • •	1. 1.		111	1. 1.	
Kinematic: N/A											,
Other information						r.					
No data available				1. 1.	1		14			14	
an an an				1. 1.			1. 1.		1 - 1 - 1 1	1. 1.	
SECTION 10. S	STAB	SILITY		RE	ACTI	VITY					
Reactivity						,					
No data available	14		1	1		1	14			14	. ' '
Chemical stability											
Stable under recomme	nded st	orage co	onditions	; ;		1.1			111	14	
Thermal decomposition	n / cond	itions to	be avoid	ded:							
Decomposition will not	occur if	used ar	nd stored	d accor	ding to s	pecificati	ons.				
Possibility of hazardou	s reactio	ons	:	<u>'</u> ,	. * *	;	<u>'</u> ,			1	
Reacts with strong oxid		-							111		
Conditions to avoid									4	· .	
No data available						1 - 1 1					

Incompatible materials:		 					
Oxidizing agents							
Hazardous decomposition products:	1			1.	 1	1 · .	. '
Metal oxide fume							
Selenium dioxide (SeO2)				· · .	 	14	
<u> </u>							
	1	 1 1	1		 1		

SECTION 11. TOXICOLOGICAL INFORMATION

Information on toxicological effects		۰.			- 1.			
Acute toxicity:		ľ						
Toxic if inhaled.		1			1 1 - 1			
Toxic if swallowed	1	1. 1.		1	1. 1.			1. 1.
LD/LC50 values that are relevant for cla	assificat	ion: No	data					
Skin irritation or corrosion: May cause in	rritation	· .		: • •				14. 14.
Eye irritation or corrosion: May cause ir	ritation		,					
Sensitization: No sensitizing effects kno	own.							
Germ cell mutagenicity: No effects know	wn.	с. С.			1. 1.		1	14. 19
Carcinogenicity:								
No classification data on carcinogenic p	propertie	es of thi	s materia	al is avai	lable fr	om the E	PA, IAR	C, [*]
NTP, OSHA or ACGIH.		, , ,						
Reproductive toxicity: No effects known		· .			÷.,			1. 1.
Specific target organ system toxicity - re								
May cause damage to the central nervo			liver an	d the dig	estive	system th	nrough	
prolonged or repeated exposure. Route	of expo	osure: C	Dral, Inha	alative.				
Specific target organ system toxicity - s	ingle ex	posure	: No effe	cts know	/n., ;			
Aspiration hazard: No effects known.								
Subacute to chronic toxicity: No effects								
Additional toxicological information:		· .			۰,			· .
To the best of our knowledge the acute								
Carcinogenic categories						. :	1.1	

						· · .			÷.	,
OSHA-Ca (Occupational Sa	afety & Hea	Ith Admi	inistrati	on)						
Substance is not listed.										
the second s			1.	- 10 1		14			14	
SECTION 12. ECO	OLOGIC		NFO	RMA	ΓΙΟΝ	14		111	14	
Toxicity	· · ·	1 - 1 1			1 - 1 1					
Aquatic toxicity:		۰.	· .			· .				
No data available		:			:	· .		:	· · ·	
Persistence and degradabil	lity	; • •	· .		10	·			· .	
No data available						.,				,
Bioaccumulative potential										
		1	·			·			÷.,	
Mobility in soil										
No data available			1.			1. 1.			1. 1.	
Ecotoxical effects:										
Remark:										
Very toxic for aquatic organ	nisms				1	14. 14.		1	14. 14.	
Additional ecological inform	nation:									
Do not allow product to read	ch groundw	vater, wa	ater cou	rses, or	sewage	system	s, even i	n small	14. 14.	
quantities.	ı									
Danger to drinking water if e	even extrer									
Also poisonous for fish and	l plankton ir	ı water b	odies.			14			14	
May cause long lasting harr										
Avoid transfer into the envir		-				14. 14.		111	14. 14.	
Very toxic for aquatic organ										
Results of PBT and vPvB a										
				. **	1	14	. * *	1		
Other adverse effects										
	, , , , ,			, , ,	111	11		1.1		
					1 - 1	,				

		'	,	· .			` ,			` .	
SECTION	13. DIS	SPOSA		SID	ERAT	IONS					
Waste treatmer	nt methods	·	1	· .			1. 1.		· :		
Recommendati	on										
Consult official	regulations	s to ensure	e proper di	sposal.							
Uncleaned pac Recommendati		н н н н			, , ,	1 - 1 1		, , ,	, , ,		
Disposal must l	be made ad	ccording to	o official re	gulatior	าร.		1.			14	
the set	;·· ·			1. 1.		111					
SECTION	14. TR	ANSP		IFOR	RMAT	ION					
UN-Number DOT, IMDG, IA											
UN3283 UN proper ship	ping name	•:		14. 1			', ',			ʻ.,	
DOT		н н н н		, , ,		н н н		н 1 — 1	н н н		
Selenium comp IMDG, IATA	ound, solic	l, n.o.s. (B	ismuth(III)	selenio	de)	1			:		
SELENIUM CC	MPOUND,	, SOLID, N	I.O.S. <u>(</u> Bis	muth(II	I) selenio	de)	· .	,		· .	
Transport haza		;)							· · · ·		
Class		·		1.			۰.				
6.1 Toxic subst	ances.										
Label			: • •	1.		; • •	1.			14	
6.1 Class	 	· · ·			, , ,	1 - 1 1					
6.1 (T5) Toxic s	substances		1			1	с. С.		1	14	
Label											
6.1		· · · · ·				111					
IMDG, IATA		· · ·		1 1 1							

					1					
Class					1 - 1 1					
6.1 Toxic substances.										
Label										
6.1										
Packing group										
DOT, IMDG, IATA					н н н					
		· .						· .		
Environmental hazards:	1	r L		1	,	1	1	ı		1
Environmentally hazardous	substance	, solid	· .			· .			· .	
Special precautions for user			1							
Warning: Toxic substances	н 1 - 1	1 - 1 1	, , ,			, , ,			, , ,	
EMS Number:			·						1.	
F-A,S-A										
Transport in bulk according	to Annex I	l of MAR	POL73	/78 and t	he IBC (Code		: * *	1. 1.	
N/A										
Transport/Additional informa	ition:	1		1 1						
DOTMarine Pollutant (DOT)	:		14		1	14		· .	14	
No										
			1. 1.			14		: * *	14	
UN "Model Regulation":										
			smuth(I	II) selenio	de), 6.1,	Ш. :				
UN3283, Selenium compour	nd, solid, r	n.o.s. (Bis								
	nd, solid, r	n.o.s. (Bis							•••	
UN3283, Selenium compour	nd, solid, r	n.o.s. (Bis ORY	INFC	RMA	TION	•				
UN3283, Selenium compour SECTION 15. REG	nd, solid, r BULAT ental regu	n.o.s. (Bis ORY lations/le	INFC egislatic	RMA	TION c for the	substa	nce or m	ixture	*.	
UN3283, Selenium compour SECTION 15. REC Safety, health and environm	nd, solid, r GULAT ental regu	n.o.s. (Bis ORY lations/le	INFC gislatic	RMA	TION c for the	substa	nce or m	ixture	*.	

GHS06 GHS08

Signal word: Danger

Hazard statements H301+H331 Toxic if swallowed or if inhaled. H373 May cause damage to the central nervous system, the liver and the digestive system through prolonged or repeated exposure. Route of exposure: Oral, Inhalative. Precautionary statements P260 Do not breathe dust/fume/gas/mist/vapors/spray. P261 Avoid breathing dust/fume/gas/mist/vapors/spray. P304+P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. P405 Store locked up. P403+P233 Store in a well-ventilated place. Keep container tightly closed. P501 Dispose of contents/container in accordance with local/regional/national/international regulations. National regulations All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory. All components of this product are listed on the Canadian Domestic Substances List (DSL). SARA Section 313 (specific toxic chemical listings) 12068-69-8 Bismuth(III) selenide California Proposition 65 Prop 65 - Chemicals known to cause cancer Substance is not listed. Prop 65 - Developmental toxicity Substance is not listed. Prop 65 - Developmental toxicity, female Substance is not listed. Prop 65 - Developmental toxicity, male

Information about limitation of use:

Substance is not listed.

For use only by technically qualified individuals.

This product is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right to Know Act of 1986 and 40CFR372.

Other regulations, limitations and prohibitive regulations

Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.

The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.

Substance is not listed. Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.

Chemical safety assessment:

A Chemical Safety Assessment has not been carried out.

SECTION 16. OTHER INFORMATION

Safety Data Sheet according to Regulation (EC) No. 1907/2006 (REACH). The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product.