

ANTIMONY



# Indian Minerals Yearbook 2021

(Part- II Metals and Alloys)

**60<sup>th</sup> Edition**

**ANTIMONY**

**(ADVANCE RELEASE)**

**GOVERNMENT OF INDIA  
MINISTRY OF MINES  
INDIAN BUREAU OF MINES**

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## 2 Antimony

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Antimony is a strategic metal. The predominant ore of antimony is stibnite composed of antimony trisulphide,  $Sb_2S_3$  (Sb 71.4%). The other important ores of antimony are jamesonite ( $Pb_2Sb_2S_5$ ) and senarmonite/valentinite ( $Sb_2O_3$ ). Antimony in its elemental form is a silvery white, brittle, fusible, crystalline solid that exhibits poor electrical and heat conductivity properties and vaporises at low temperatures. Antimony and some of its alloys exhibit unusual property of expansion on cooling. Commercial forms of antimony are generally traded in the form of ingots, broken pieces, granules or cast cake. Other forms are powder, shots and single crystals. Occurrence of antimony in the earth crust ranges from 0.2 to 0.5 parts per million. Antimony is geochemically categorised as a chalcophile, occurring with sulphur and associated with heavy metals, such as, lead, copper and silver.

### RESERVES/RESOURCES

As per the NMI database based on UNFC system, as on 1.4.2020, the total reserves/resources of antimony has been estimated at 18,683 thousand tonnes. The ore with metal content is placed at 255 thousand tonnes, all in Inferred category located in Lahaul & Spiti district, Himachal Pradesh (Table-1).

The stibnite and its decomposition products, cervantite and kermesite occur as veins, stringers and specks. Occurrences of antimony ores are also reported from the States of Andhra Pradesh, Jharkhand, Karnataka, Uttarakhand and Union Territory of Jammu & Kashmir.

### USES

Antimony and its alloys find numerous applications in a wide range of high technology industries like electronic, space defence, photographic materials, electroplating, besides cosmetic, paint, plastics and textile industries. Traditionally, it is used in type metal in Printing

Industry and other alloys. It is now used extensively worldwide to harden and increase the mechanical strength of lead, particularly in Battery Industry. Antimony trioxide is the most important of the antimony compounds and is primarily used in flame-retardant applications, including such markets, as children's clothing, toys as well as in manufacturing aircraft and automobile seat covers. Antimony sulphide is one of the ingredients used in safety matches. It is used in solar panels to improve stability of the solar performance of the glass upon exposure to UV radiations or sunlight and also as a decolourising and refining agent in Glass Industry. Antimony compounds also find use in pharmaceutical applications. It is also used in semiconductors for making infrared detectors, diodes & acoustic devices, and in plastic production as a heat stabiliser in PVC.

### INDUSTRY

The metal is obtained commonly as a by-product in lead-zinc-silver smelting. As part of its R & D programme, HZL successfully implemented antimony dust treatment flow sheet at Ancillary Industry. Antimony dust at Pantnagar Metal Plant (PMP) was leached in controlled conditions to recover antimony as Potassium Antimony Tartarate (PAT) reagent which is used in Zinc Hydro plants purification section and enriched lead silver residue. Presently, there is no production of antimony in India. The entire requirement of antimony in the country is met through imports of its ore and concentrates. HZL is currently operating metal plant having 1,400 TPA antimony concentrate (by-product). The antimony slag is recovered as antimony trioxide with more than 95% purity, which is commercially accepted with high demand as flame retardant.

**Table – 1 : Reserves/Resources of Antimony as on 1.4.2020  
(By Grades/Stages)**

(In '000 tonnes)

Grade/State	Reserves			Remaining Resources					Total Resources (A+B)	
	Proved STD111	Probable STD121	Total (A) STD122	Feasibility STD211	Pre-feasibility STD221	Measured STD331	Indicated STD332	Inferred STD333		Reconnaissance STD334
<b>All India : Total</b>										
Ore	0	7503	7503	0	0	0	0	10588	0	11180
Metal	0	75	75	0	0	0	0	174	0	179.92
<b>By State</b>										
Himachal Pradesh										
Ore	0	0	0	0	0	0	0	10588	0	10588
Metal	0	0	0	0	0	0	0	174	0	174
Madhya Pradesh										
Ore	0	7503	7503	0	0	0	0	0	0	592
Metals	0	75	75	0	0	0	0	0	0	5.92

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*Figures rounded off*

## SUBSTITUTES

Combination of tin, calcium, copper, selenium, cadmium, strontium and sulphur is among the substitutes used as hardeners for lead used in batteries. Low maintenance batteries have started using calcium as additive to substitute antimony. Antimony can be replaced by organic compounds or hydrated aluminium oxide in flame-retardants and by tellurium and selenium in rubber manufacturing. Compounds of titanium, zinc, chromium, tin and zirconium are substituted for antimony chemicals in paints, pigments and enamels.

## TECHNICAL POSSIBILITIES

Antimony products can be used as stabilisers in specialised plastics. Development of electric vehicles could lead to the use of high antimonial lead batteries because of their deep cycling characteristics. Antimony semiconductors have possible use in aircraft night vision systems and in space-based astronomy. Antimony has also been found to be used in the manufacture of DVDs.

## RECYCLING

Traditionally, the bulk of secondary antimony has been recovered at secondary lead smelters as antimonial lead, most of which was generated and then consumed by the Lead-acid Battery Industry.

## WORLD REVIEW

The world reserves of antimony were 2.0 million tonnes in terms of metal content. Antimony reserves are located mainly in China, which contributes about 24% of the total reserves followed by Russia (18%), Bolivia (16%), Kyrgyzstan (13%), Australia (5%), Turkey (5%), Canada (4%) USA & Tajikistan(3% each) (Table-2).

The world mine production of antimony metal decreased by 7% to 1,23,000 tonnes in 2020 as against 1,32,000 tonnes in the previous year. China with (52%) production was the main producer of antimony in the world followed by Tajikistan (18%), Russia (14%) and Iran (4%) (Table-3).

China continued to be the leading antimony producing country in the world. The Chinese Government considered antimony to be one of the protected and strategic minerals, and therefore, strictly controlled the exploitation and production

of antimony. In Oman, construction of an antimony smelter with 20,000 tonnes per year capacity of antimony metal and antimony oxide was initiated after acquisition of funds and other developmental proceedings put into place.

**Table – 2 : World Reserves of Antimony  
(By Principal Countries)**

(In tonnes of metal content)	
Country	Reserves
<b>World : Total (rounded off)</b>	<b>2000000</b>
Australia	100000
Bolivia	310000
Myanmar	NA
Canada	78000
China	480000
Ecuador	NA
Guatemala	NA
Iran	NA
Kazakhstan	NA
Kyrgyzstan	260000
Laos	NA
Mexico	18000
Pakistan	26000
Russia (recoverable)	350000
Tajikistan	50000
Turkey	100000
USA	60000 <sup>(a)</sup>
Vietnam	NA
Burma	140000

*Source: USGS, Mineral Commodity Summaries, 2022*

NA - Not available

(a) Company-reported probable reserves for the Stibnite Gold Project in Idaho.

(b) For Australia, Joint Ore Reserves committee-compliant reserves were 18000 tonnes.

**Table – 3 : World Mine Production of Antimony  
(By Principal Countries)**

(In tonnes of metal content)			
Country	2018	2019	2020
<b>World: Total (rounded off)</b>	<b>174000</b>	<b>132000</b>	<b>123000</b>
China	95286	60229	64530
Tajikistan	28881	29898	22500
Russia	30828	21671	17532
Myanmar <sup>(e)</sup>	5400	5000	-
Turkey	3500	3815	2570
Bolivia	3110	2747	2629
Iran <sup>(j)</sup>	2551	5264	5300
Australia <sup>(e)</sup>	2866	2170	3903
Vietnam	244	395	388
Other countries	6505	5543	3978

*Source: BGS, World Mineral Production, 2016-20*

(c) Years ended 30 June of that stated.

(j) Years ended 31 March following that stated

## FOREIGN TRADE

### Exports

Exports of antimony ores & concentrates was nil for the years 2020-21 and 2019-20.

Exports of antimony alloys and scrap decreased slightly by 4 % to 2,134 tonnes in 2020-21 as against 2,217 tonnes in the previous year. Exports were mainly to USA (79%), Brazil (4%) and UAE, Netherlands & Canada (3%each). Exports of antimony (Unwrought) powders also decreased to 2,130 tonnes in 2020-21 as against 2,205 tonnes in 2019-20. Exports of antimonial lead were at 15,839 tonnes in 2020-21 as compared to 14,200 tonnes in 2019-20 (Tables- 4 to 8).

### Imports

Imports of antimony ores and concentrates decreased by 22% to 5,977 tonnes in 2020-21 as compared to 7,656 tonnes in the previous year. Imports were mainly from Russia (56%), China & Canada (19% each), Tajikistan (4%) and remaining one per cent was contributed by other countries.

Imports of antimony alloys and scrap decreased substantially by 10% to 1,319 tonnes in 2020-21 from 1,465 tonnes in the previous year. Imports of alloys and scrap were mainly from China (53%), Vietnam (12%, Netherlands (9%), Singapore (7%), Thailand (6%) and Oman (4%). Imports of antimony (Unwrought) powders decreased by 11% to 1,298 tonnes in 2020-21 as compared to 1,456 tonnes in the preceding year. Imports were mainly from China (53%), Vietnam & Netherlands (10% each), Singapore (7%), Thailand (6%) and Oman (4%)(Tables-9 to 13).

**Table – 4 : Exports of Antimony Ores & Conc.  
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹ '000)	Qty (t)	Value (₹ '000)
<b>All Countries</b>	-	-	-	-
Japan	-	-	-	-
Canada	-	-	-	-

\* As per HS Code 26171000 (Antimony res & Conc.) for the year 2020-21, no data found.

**Table – 5 : Exports of Antimony (Unwrought)  
Powders  
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹ '000)	Qty (t)	Value (₹ '000)
<b>All Countries</b>	<b>2205</b>	<b>919911</b>	<b>2130</b>	<b>930744</b>
USA	1657	682716	1679	716907
Brazil	42	17589	84	46566
UAE	26	11765	73	34572
Netherlands	49	24526	69	32042
Canada	73	28925	71	28770
Thailand	-	-	50	22679
Italy	116	46154	23	11868
Egypt	20	8264	20	8405
Mexico	-	-	20	7976
Bangladesh	5	2100	17	7530
Other Countries	217	97872	24	13429

Figures rounded off

**Table – 6 : Exports of Antimony & Articles, NES  
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹ '000)	Qty (t)	Value (₹ '000)
<b>All Countries</b>	<b>12</b>	<b>7464</b>	<b>4</b>	<b>2178</b>
Nepal	++	54	3	1267
Uganda	1	462	1	657
Sudan	-	-	++	225
UAE	-	-	++	15
Bhutan	++	5	++	8
Congo D. Rep.	-	-	++	4
Sweden	-	-	++	2
Sri Lanka	9	5482	-	-
Kenya	2	821	-	-
Germany	++	514	-	-
Other countries	++	126	-	-

Figures rounded off

**Table – 7: Exports of Antimony Alloys & Scrap  
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹ '000)	Qty (t)	Value (₹ '000)
<b>All Countries</b>	<b>2217</b>	<b>927375</b>	<b>2134</b>	<b>932922</b>
USA	1657	682716	1679	716907
Brazil	42	17589	84	46566
UAE	26	11765	73	34587
Netherlands	49	24526	69	32042
Canada	73	28925	71	28770
Thailand	-	-	50	22679
Italy	116	46154	23	11868
Egypt	20	8264	20	8405
Mexico	-	-	20	7976
Bangladesh	5	2100	17	7530
Other countries	229	105336	28	15592

*Figures rounded off*

**Table – 8: Exports of Antimonial Lead  
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹ '000)	Qty (t)	Value (₹ '000)
<b>All Countries</b>	<b>14200</b>	<b>2159294</b>	<b>15839</b>	<b>2395362</b>
Bangladesh	3073	460895	6084	905373
UAE	3046	463801	4102	619059
Vietnam	2128	331542	1421	213221
Korea, Rep. of	1402	206320	1120	176475
Japan	1572	240298	842	126448
Oman	1487	219695	852	126136
USA	284	46523	548	90144
Nepal	415	64630	383	60365
Spain	157	23676	204	34462
Malaysia	75	11269	176	26993
Other countries	561	90645	107	16686

*Figures rounded off*

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**Table – 9 : Imports of Antimony Ores & Conc.  
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹ '000)	Qty (t)	Value (₹ '000)
<b>All Countries</b>	<b>7656</b>	<b>1265983</b>	<b>5977</b>	<b>1072406</b>
Russia	6273	1014285	3355	583767
Canada	57	10971	1133	207763
China	958	154931	1155	207247
Tajikistan	-	-	249	51502
Myanmar	50	10769	60	11181
Italy	49	23002	25	10941
Thailand	-	-	++	5
USA	269	52025	-	-

*Figures rounded off*

**Table – 10 : Imports of Antimonial Lead  
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹ '000)	Qty (t)	Value (₹ '000)
<b>All Countries</b>	<b>20150</b>	<b>2995867</b>	<b>30477</b>	<b>4523873</b>
Malaysia	6204	897235	11878	1703491
Korea, Rep. of	6973	1086005	5553	848224
Singapore	945	139290	5194	770024
UAE	3008	434964	2459	368954
Saudi Arabia	296	42198	2002	306045
Belgium	-	-	596	105772
Thailand	-	-	499	78370
Mexico	-	-	471	74354
Lebanon	123	16301	364	52997
Nigeria	203	30467	222	34645
Other countries	2398	349407	1239	180997

*Figures rounded off*

**Table – 11 : Imports of Antimony & Articles, NES  
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹ '000)	Qty (t)	Value (₹ '000)
<b>All Countries</b>	<b>9</b>	<b>5482</b>	<b>21</b>	<b>10067</b>
Vietnam	-	-	21	9368
USA	++	1065	++	414
UK	-	-	++	224
Germany	++	16	++	61
China	9	4401	-	-

*Figures rounded off*

**Table – 12 : Imports of Antimony (Unwrought), Powders  
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹ '000)	Qty (t)	Value (₹ '000)
<b>All Countries</b>	<b>1456</b>	<b>654785</b>	<b>1298</b>	<b>581296</b>
China	948	431246	693	320171
Vietnam	46	18606	134	62034
Netherlands	25	11134	124	55557
Singapore	123	51249	93	39818
Thailand	147	68820	77	33425
Oman	-	-	58	23937
Myanmar	-	-	24	10307
Japan	-	-	25	10303
Hong Kong	94	41148	25	10010
UK	48	21240	25	9953
Other countries	25	11342	20	5781

*Figures rounded off*

**Table – 13 : Imports of Antimony Alloys & Scrap  
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹ '000)	Qty (t)	Value (₹ '000)
<b>All Countries</b>	<b>1465</b>	<b>660699</b>	<b>1319</b>	<b>591363</b>
China	957	435647	693	320171
Vietnam	46	18606	155	71402
Netherlands	25	11134	124	55557
Singapore	123	51249	93	39818
Thailand	147	68820	77	33425
Oman	-	-	58	23937
Myanmar	-	-	24	10307
Japan	-	-	25	10303
UK	48	21672	25	10177
Hong Kong	94	41148	25	10010
Other countries	25	12423	20	6256

*Figures rounded off*



## **FUTURE OUTLOOK**

The future growth in demand for antimony will be much dependent on the level of requirement from the Flame-retardant Sector which accounts for about 48% primary antimony consumption worldwide and for about 90% global antimony trioxide consumption.

In the Flame-retardant Sector, antimony trioxide is used as a synergist normally with bromine and chlorine. Currently, antimony-based catalysts account for around 90% usage worldwide in polyethylene terephthalate (PET) production.

A new chip, based on germanium-antimony-telluride was developed abroad for 'Phase-change' Random Access Memory chips (PRAMS) which can process data faster than flash memory chips and unlike silicon are non-flammable. The chips have been commercialised and are expected to find

applications in mobile phones and digital cameras. In contrast, antimony metal consumption in metallurgical and battery markets could show a declining trend. The recent research and development programmes initiated by lead-acid battery manufacturers have led to significant changes in lead-acid battery design that have yielded substantial performance improvement which is bound to make lead-acid batteries a better and viable option as compared to its counterparts. This would eventually result in reduced use of antimony in lead-acid batteries diminishing the prospect of use of antimony in Battery Markets. The world supplies of antimony are expected to rise to an extent sufficient enough to meet the prospective demand. However, as per USGS, global consumption of antimony is expected to increase owing to projected increase in the use of antimony in flame retardants, lead-acid batteries and plastics, primarily in Asia.

