

ANTIMONY



# Indian Minerals Yearbook 2012

(Part- II : Metals & Alloys)

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**ANTIMONY**

(FINAL RELEASE)

**GOVERNMENT OF INDIA  
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## 2 Antimony

Antimony is a strategic metal. The predominant ore of antimony is stibnite composed of antimony trisulphide,  $Sb_2S_3$ , (Sb 71.4%). 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 are unusual in nature that they expand 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. The 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, lead, copper and silver. The metal is obtained commonly as a by-product in lead-zinc-silver smelting. One of the studies conducted by HZL was related to recovery of antimony-rich residue from antimony dross of Pyro-smelter.

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.

### RESOURCES

As per the UNFC system, as on 1.4.2010, total resources are estimated at 10,588 tonnes ore with metal content of 174 tonnes, all in inferred category 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,

Bihar, Jammu & Kashmir, Karnataka and Uttar Pradesh.

### USES

Antimony and its alloys find numerous applications in a wide range of high technology industries like electronic, space and defence, photographic materials, electroplating, besides cosmetic, paint, plastics and textile industries. Traditionally, it is used in type metal 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, aircraft and automobile seat covers. Antimony sulphide is one of the ingredients of safety matches. It is also used as a decolourising and refining agent in glass industry. Antimony compounds may be used in pharmaceuticals. It is also used in semi-conductors for making infrared detectors, diodes and acoustic devices.

### SUBSTITUTES

Combination of tin, calcium, copper, selenium, cadmium, strontium and sulphur are 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 may be substituted for antimony chemicals in paints, pigments and enamels.

**Table – 1 : Reserves/Resources of Antimony as on 1.4.2010  
(By State)**

India/State		Reserves Total (A)	Remaining resources		Total resources (A+B)
			Inferred (STD 333)	Total (B)	
(In tonnes)					
<b>India</b>	<b>Ore</b>	–	<b>10588</b>	<b>10588</b>	<b>10588</b>
	<b>Metal</b>	–	<b>174</b>	<b>174</b>	<b>174</b>
Himachal Pradesh	Ore	–	10588	10588	10588
	Metal	–	174	174	174

## TECHNICAL POSSIBILITIES

Antimony products can be used as stabilizers in specialised plastics. Development of electric vehicles could lead to the use of high antimony batteries because of their deep cycling characteristics. Antimony semiconductors have possible use in aircraft night vision systems and in space-based astronomy. The antimonial lead scrap extracted from the spent lead acid storage batteries is recycled largely from and for storage battery industry. Antimony has found a new use in the manufacture of DVDs.

## WORLD REVIEW

The world reserves of antimony are 1.8 million tonnes in terms of metal content. Antimony reserves are located mainly in China, which contributes about 53% to the total reserves followed by Russia (19%), Bolivia (17%), Tajikistan (3%) and South Africa (1%) (Table-2).

The world production of antimony metal decreased to 147,000 tonnes in 2011 as against 148,300 tonnes in the previous year. China was the main producer of antimony accounting for about 87% of world production. Tajikistan, Bolivia, Russia, South Africa and Australia were the other important producers (Table-3).

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

(In tonnes of metal content)	
Country	Reserves
<b>World : Total (rounded)</b>	<b>1,800,000</b>
Bolivia	310000
China	950000
Russia (Recoverable)	350000
South Africa	27000
Tajikistan	50000
Other countries	150000

*Source: Mineral Commodity Summaries, 2013.*

## China

China dominates the world antimony production. The government of China announced a slight reduction in export quota for Antimony from 66,000 tonnes in 2011 to 59,400 tonnes in 2012. Inner Mongola Yulong mine Co. Ltd completed its survey at its Hua'aobao silver-lead-zinc mine and discovered antimony in the associated minerals. The antimony reserves were estimated to be 155,000 tonnes at a grade of 0.69%.

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

(In tonnes of metal content)			
Country	2009	2010	2011
<b>World : Total</b>	<b>128000</b>	<b>148300</b>	<b>147000</b>
Australia	1794	707	1751
Bolivia	2990	4980	3947
Canada	64	69	68
China	112000	129831	128017
Kyrgyzstan	918	900e	900e
Kazakhstan	597	785	800e
Mexico	74	71	5
Peru	145	-	-
Russia <sup>e</sup>	3000	3000	3000
South Africa	2090	2257	2391
Tajikistan	2447	3341	4000
Thailand	555	705	442
Turkey	1300	1300	1300
Other countries	26	354	379

*Source: World Mineral Production, 2007-2011.*

## FOREIGN TRADE

### Exports

Exports of antimony alloys and scrap were 1,410 tonnes in 2011-12 against 954 tonnes in the previous year. Exports were mainly to USA (49%), Pakistan (22%), Japan (9%) and Hong Kong (6%) (Table - 4).

### Imports

Imports of antimony ores and concentrates increased considerably to 3,712 tonnes in 2011-12 from 2,547 tonnes in the previous year. Imports were mainly from South Africa (83%), Germany, China and Japan (3%) each. Import of antimony alloys and scrap decreased in 2011-12 from 543 tonnes in the previous year to 380 tonnes in the current year. Import of alloys and scrap was mainly from China (90%) (Tables- 5 and 6).

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**Table – 4 : Exports of Antimony Alloys and Scrap  
(By Countries)**

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>954</b>	<b>464038</b>	<b>1410</b>	<b>872560</b>
USA	200	106176	685	408087
Pakistan	95	51504	314	200890
Japan	10	5077	128	80662
Hong Kong	20	13063	87	53155
Netherlands	84	40698	50	33843
Thailand	287	147658	40	23932
Spain	-	-	24	16589
UAE	1	767	17	13292
Egypt	5	2783	15	10069
Russia	60	24894	20	9936
Other countries	192	71418	30	22105

**Table – 5 : Imports of Antimony Ores & Conc.  
(By Countries)**

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>2547</b>	<b>446982</b>	<b>3712</b>	<b>1153868</b>
South Africa	1707	288584	3065	962586
Germany	-	-	103	35212
Russia	193	35972	98	34833
China	82	14236	103	34379
Japan	-	-	103	25185
Italy	184	33842	46	22866
Peru	-	-	53	11706
Thailand	-	-	87	11401
Australia	-	-	44	11021
Austria	4	2105	5	2174
Other countries	377	72243	5	2505

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**Table – 6 : Imports of Antimony Alloys & Scrap  
(By Countries)**

Country	2010-11		2011-12	
	Qty (t)	Value (₹ '000)	Qty (t)	Value (₹ '000)
<b>All Countries</b>	<b>543</b>	<b>256726</b>	<b>380</b>	<b>356570</b>
China	490	234233	343	328995
France	-	-	20	15227
Chinese Taipei/Taiwan	20	5967	15	11180
Germany	2	490	2	924
Malaysia	-	-	++	197
UK	++	63	++	44
USA	2	1516	++	2
Other countries	29	14457	++	1

## FUTURE OUTLOOK

Continued mining restrictions in China may result in higher market prices of antimony. The future growth in demand for antimony will be much dependent on the level of requirement from the flame-retardant sector which accounts for 55% 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 are commercialised and expected to find applications in mobile telephones and digital cameras. In contrast, little or no growth is anticipated for antimony metal in metallurgical and battery markets.