

# 70 Silver

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**S**ilver is one of the five noble metals. It has brilliant white colour, malleability and resistance to atmospheric oxidation. Apart from its monetary and decorative uses, its highest known electrical conductivity amongst all metals has found application in modern age; viz, for printed electric circuits, coating for electronic conductors and in alloys of gold and copper for electrical contacts. Its chloride and iodide are light-sensitive and hence used in photographic material. These two modern uses are responsible for contributing its supply as scrap.

In India, there are no native silver deposits except the small and unique Bharak deposit of silver in Rajasthan. It occurs generally with lead, zinc, copper and gold ores and is extracted as a by-product from electrolysis or chemical methods.

Silver is recovered as a co-product as well as a by-product in the country. Silver was recovered in the past as a co-product in gold refining at KGF Complex and Hutti Gold Mines in Karnataka, as a by-product in smelting and refining of lead, zinc and copper concentrates at Chanderiya and Debari smelters in Rajasthan, Tundoo and Moubandar (Ghatsila) smelters in Jharkhand and at Visakhapatnam smelter in Andhra Pradesh. The present production of silver comes from Chanderiya lead-zinc smelter of HZL and from gold refinery of HGML. In addition, Hindalco extracts silver as by-product during smelting of imported copper concentrates, at Dahej in Gujarat.

The installed capacity for recovery of silver at various plants are: HCL 6.1 tpy; HZL 168 tpy and Hindalco 150 tpy. Besides, Sterlite Industries (India) Ltd is in the process of obtaining world class technology for recovery of

minor metals from imported copper concentrates and smelter by-products at its Tuticorin smelter, Tamil Nadu.

## RESOURCES

As per the UNFC system, the total resources of silver ore in the country as on 1.4.2005, were estimated at about 244.63 million tonnes. Out of these, 115.91 million tonnes were placed under reserve category and 128.72 million tonnes under the remaining resources category.

The total resources of silver in the country as on 1.4.2005 in terms of metal were estimated at 10,212.62 tonnes, comprising 6,058.33 tonnes under reserves and 4,154.29 tonnes under the remaining resources.

By States, Rajasthan accounted, for about 84% resources and Jharkhand 10%, Karnataka, Uttarakhand, Andhra Pradesh, Odisha, Meghalaya, Sikkim, Tamil Nadu and Maharashtra together shared 6% resources (Table - 1).

## PRODUCTION

In 2009-10, the production of silver at 138,768 kg increased by 32% as compared to the previous year mainly because of higher recovery of silver at Chanderiya. The production of silver from gold refining was 218 kg in 2009-10 as against 229 kg in 2008-09. One private sector and two public sector undertakings reported production of silver in 2009-10 (Tables - 2 to 4).

In addition, Hindalco Industries Ltd recovered 37,310 kg and 44,860 kg silver from imported copper concentrates in 2008-09 and 2009-10, respectively.

**Table – 1 : Reserves/Resources of Silver as on 1.4.2005  
(By Grades/States)**

Grade/State	Reserves				Remaining resources						Total resources (A+B)		
	Proved		Probable		Feasibility		Pre-feasibility		Indicated			Inferred	Total (B)
	STD111	STD121	STD121	STD122	STD211	STD222	STD331	STD332	STD333				
		Total (A)	Total (A)										
<b>All India : Total</b>													
Ore	55752053	1707043	58453642	115912738	3375000	11864000	1900000	34370000	77211729	128720729	244633467		
Metal	2283.19	133.81	3641.33	6058.33	270	878.18	161.6	958.24	1886.27	4154.29	10212.62		
<b>By States</b>													
<b>Andhra Pradesh</b>													
Ore	686250	-	105000	791250	-	-	-	-	90000	90000	881250		
Metal	5.19	-	0.79	5.98	-	-	-	-	1.08	1.08	7.06		
<b>Jharkhand</b>													
Ore	-	-	-	-	-	-	-	-	23840000	23840000	23840000		
Metal	-	-	-	-	-	-	-	-	5.22	5.22	5.22		
<b>Karnataka</b>													
Ore	7208303	-	69462	7277765	-	-	-	-	314150	314150	7591915		
Metal	2.67	-	0.48	3.15	-	-	-	-	2.92	2.92	6.07		
<b>Maharashtra</b>													
Ore	-	-	-	-	-	-	-	-	235000	235000	235000		
Metal	-	-	-	-	-	-	-	-	0.23	0.23	0.23		
<b>Meghalaya</b>													
Ore	-	-	-	-	-	-	-	880000	-	880000	880000		
Metal	-	-	-	-	-	-	-	19.8	-	19.8	19.8		
<b>Odisha</b>													
Ore	960500	-	119000	1079500	-	-	-	-	670000	670000	1749500		
Metal	27.43	-	3.4	30.83	-	-	-	-	34.17	34.17	65		
<b>Rajasthan</b>													
Ore	46897000	1271200	58096400	106264600	3375000	11864000	-	31370000	51452579	98061579	204326179		
Metal	2247.9	118.56	3636.62	6003.08	270	878.18	-	917.98	1802.17	3868.33	9871.41		
<b>Sikkim</b>													
Ore	-	435843	63780	499623	-	-	300000	-	150000	450000	949623		
Metal	-	15.25	0.04	15.29	-	-	27.6	-	13.8	41.4	56.69		
<b>Tamil Nadu</b>													
Ore	-	-	-	-	-	-	-	330000	460000	790000	790000		
Metal	-	-	-	-	-	-	-	15.87	26.68	42.55	42.55		
<b>Uttarakhand</b>													
Ore	-	-	-	-	-	-	1600000	1790000	-	3390000	3390000		
Metal	-	-	-	-	-	-	134	4.59	-	138.59	138.59		

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**Table – 2 : Principal Producers of Silver, 2009-10**

Name & address of the producer	Name of Plant	Location of the plant	
		State	District
M/s Hindustan Zinc Ltd Yashad Bhavan Udaipur – 313 001.	Chanderiya	Rajasthan	Chittorgarh
The Hutti Gold Mines Co. Ltd, No. 6/13, Guruappa Avenue Primrose Road Cross Bangalore – 560 025.	Hutti	Karnataka	Raichur

**Table – 3 : Production of Silver, 2007-08 to 2009-10  
(By States\*)**

(Qty in kg; value in Rs.'000)

State	2007-08		2008-09		2009-10(P)	
	Qty	Value	Qty	Value	Qty	Value
<b>India</b>	<b>80697</b>	<b>1521443</b>	<b>105284</b>	<b>2147578</b>	<b>138768</b>	<b>3388389</b>
Karnataka	294	5683	229	5216	218	5465
Rajasthan	80403	1515760	105055	2142362	138550	3382924

\* According to location of final processing/extraction plant.  
Excludes by-product recovery of silver by Hindalco Industries Ltd at Dahej, Gujarat from imported copper concentrates.

**Table – 4 : Production of Silver\*, 2008-09 and 2009-10  
By Sector/States/Districts)**

(Qty in kg; value in Rs.'000)

State/District	2008-09		2009-10(P)	
	Quantity	Value	Quantity	Value
<b>India</b>	<b>105284</b>	<b>2142362</b>	<b>138768</b>	<b>3388389</b>
Public sector	229	5216	218	5465
Private sector	105055	2142362	138550	3382924
<b>Karnataka</b>	<b>229</b>	<b>5216</b>	<b>218</b>	<b>5465</b>
Raichur	229	5216	218	5465
<b>Rajasthan</b>	<b>105055</b>	<b>2142362</b>	<b>138550</b>	<b>3382924</b>
Chittorgarh	105055	2142362	138550	3382924

\* Silver is a by-product

(i) In Karnataka, it is recovered during refining of gold from Hutti and Uti gold ores.

(ii) In Rajasthan, it is recovered at Chanderiya lead-zinc smelter of HZL.

Excludes by product recovery of 37,310 kg and 44,860 kg silver by Hindalco Industries Ltd at Dahej, Gujarat from imported copper concentrates during 2008-09 and 2009-10, respectively.

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### WORLD REVIEW

The total reserves of silver are estimated at 400,000 tonnes. Chile, Peru, Poland, Mexico, China, and Australia were the main countries having silver reserves (Table-5). Major part of the reserves is associated with base metals, such as copper, lead and zinc.

Peru, Mexico, China, Australia, Russia, Bolivia, and USA were the main producers of silver. The global primary as well as by-product mine output increased at 22,236 tonnes of contained metal in 2009 from 21,683 tonnes in the previous year. World mine production of silver is given in Table-6.

#### Argentina

Pan American Silver Corporation (Vancouver) reported an overall increase of 23% in silver production a new company record, as a result of start up of the Manantial Espejo mine of the company. The mine is expected to be Pan American Silver Corporation's leading silver producing mine.

#### Bolivia

Pan American Silver expanded mill capacity at San Vincerte resulting in higher production at the mine. Coeur d' Arlene Mines Corporation's San Bartolome mine reported 210 tonnes silver in its first full year production compared to 80 tonnes in the preceding year.

#### Mexico

Mexico was the world's second ranked producer of silver. Silver production increased by 10%. Coeur d' Arlene Mines' new mine, the Palmarejo Mine began production of silver and also gold in 2009. The mine has the capacity to produce 220 to 250 tonnes silver annually.

#### Peru

Hochschild Mining plc. completed Selene mill expansion from 2,000 tpd to 3,000 tpd resulting in 50% increased production at its Pallancanta mine.

**Table – 5 : World Reserves of Silver\*  
(By Principal Countries)**

(In tonnes of metal content)

Country	Reserves
<b>World : Total</b>	<b>400000</b>
Australia	31000
Bolivia	18000
Canada	16000
Chile	70000
China	34000
Mexico	37000
Peru	59000
Poland	55000
USA	25000
Other countries	50000

*Source: Mineral Commodity Summaries, 2010.*

*\* Includes silver recoverable from base metal ores.*

**Table – 6 : World Mine Production of Silver  
(By Principal Countries)**

(In tonnes of metal content)

Country	2007	2008	2009
<b>World : Total</b>	<b>21273</b>	<b>21683</b>	<b>22236</b>
Australia	1880	1926	1633
Bolivia	525	1114	1326
Canada	861	755	631
Chile	1936	1405	1301
China	2700*	2800*	2900*
Kazakhstan*	723	646	618
Mexico	3135	3236	3554
Peru	3493	3686	3854
Poland	1199	1161	1150
Russia*	1200	1300	1400
USA	1281	1250	1239
Other countries	2340	2404	2630

*Source: World Mineral Production, 2005-2009.*

*\* Smelted and/or refinery production.*

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**FOREIGN TRADE****Exports**

In 2009-10, there were no exports of silver ores and conc. Exports of silver were 62 tonnes in 2009-10 against 35 tonnes in the previous year. Exports were mainly to UAE, Switzerland and USA. Besides, 26 kg silver-clad base metals were also exported during 2009-10 (Tables 7 to 9).

**Imports**

Imports of silver in 2009-10 decreased to 2,075 tonnes from 5,696 tonnes in the preceding year. Imports were mainly from Chinese Taipei (16%), China and UK (14% each), Switzerland (12%) Hong Kong (11%), and Russia (8%). Imports of silver-clad base metals decreased to 31 kg in 2009-10 from 94 kg in the previous year. USA was the sole supplier. (Tables 10 and 11).

**Table – 7 : Exports of Silver Ores & Concentrates**

Country	2008-09		2009-10	
	Qty (kg)	Value (Rs. '000)	Qty (kg)	Value (Rs. '000)
<b>All Countries</b>	<b>41500</b>	<b>19</b>	–	–
Nepal	41500	19	–	–

**Table – 8 : Exports of Silver (By Countries)**

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>35</b>	<b>677720</b>	<b>62</b>	<b>4263083</b>
UAE	++	207	22	3327250
Switzerland	10	201552	16	399998
USA	8	144306	15	339229
Italy	++	1055	3	56817
UK	4	93885	3	26958
Australia	2	26223	1	16327
Sweden	1	11458	1	15143
Iran	4	78064	–	–
Japan	3	62886	–	–
Unspecified	–	–	1	60117
Other countries	3	58084	++	21244

**Table – 9 : Exports of Silver-clad Base Metals (By Countries)**

Country	2008-09		2009-10	
	Qty (kg)	Value (Rs. '000)	Qty (kg)	Value (Rs. '000)
<b>All Countries</b>	<b>458</b>	<b>1193</b>	<b>26</b>	<b>34</b>
UK	–	–	25	26
Argentina	–	–	1	8
France	161	396	–	–
UAE	65	75	–	–
USA	232	722	–	–

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**Table – 10 : Imports of Silver  
(By Countries)**

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>5696</b>	<b>94684290</b>	<b>2075</b>	<b>45636507</b>
Chinese Taipei	30	539442	330	7670743
China	829	14558518	292	6975270
UK	2064	35828362	285	6479946
Switzerland	638	10965021	248	5911808
Hong Kong	177	3577303	222	5043947
Russia	670	11165377	161	3801296
UAE	188	3533179	131	3130020
Korea Rep. of	81	1491734	100	2191172
USA	334	2901073	127	416583
Canada	121	2048687	–	–
Other countries	564	8075594	179	4015722

**Table – 11 : Imports of Silver-clad Base Metals  
(By Countries)**

Country	2008-09		2009-10	
	Qty (kg)	Value (Rs. '000)	Qty (kg)	Value (Rs. '000)
<b>All Countries</b>	<b>94</b>	<b>518</b>	<b>31</b>	<b>223</b>
USA	66	133	31	223
Czech Republic	2	10	–	–
Italy	25	307	–	–
Switzerland	1	67	–	–
Other countries	++	1	–	–