



Proceedings

INDIA
SILVER
CONFERENCE

28-30 April 2023

Le Meridien Resort & Spa, Jaipur

Ag 47

www.silverconference.in

MARK

YOUR

DATES

2nd

INDIA SILVER CONFERENCE

26-28 April 2024, Goa

MARK

YOUR

DATES



Hindustan Platinum

Enriching everyday life through precious metals!

With an impressive legacy of over six decades, Hindustan Platinum is a specialist when it comes to refining and manufacturing precious metals products and providing related services. Hindustan Platinum is a one-stop solution to all your Silver refining needs.

Hindustan Platinum's Silver bullion cast bars are available in a wide range of sizes, including 25 gm, 1 oz, 100 gm, 250 gm, 10 oz, 500 gm, 1 kg and 30 kg in addition to Silver grains with 999.0 and 999.9 purity.



Our 1 kg and 30 kg London Good Delivery LBMA accredited Silver bullion are accepted by all major Commodity Exchanges.



Hindustan Platinum is an accredited London Bullion Market Association (LBMA) refiner and on the London Good Delivery List for Silver.

Hindustan Platinum Pvt. Ltd.,

VIOS Tower, 22nd Floor, New Cuffe Parade, Wadala, Mumbai 400 037, India | Phone: +91 22 6922 5000 | E-mail: info@hp.co.in

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For your
Precious Metal
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- Silver Grains
- Silver Bars
- Silver Coins
- Platinum Chains
- Platinum Coins
- Platinum Bars
- Master Alloys

Also offering Precious
Metal Refining



SOVEREIGN METALS LIMITED



SOVEREIGN METALS LIMITED

Is one of the largest state of art Greenfield Gold/Silver refinery in India Located at Ahmedabad, State of Gujarat.

- The management team has experience of more than 20 years in the business of precious metals.
- We have a distinguished manufacturing unit, well set up to produce best quality products, having an excellent blend of refining and large-scale bullion distribution capabilities with highly efficient sourcing channels.
- Our vision is to be a world-class Refining Company, with a strong emphasis on high standards of productivity, best-in-class operations to deliver best quality products, all stakeholders satisfaction, corporate social responsibility, safety, health, and environmental management.

OVERVIEW

- State-of-art greenfield Gold/Silver refinery
- 15,000sq. meter refining complex
- More than 50% complex area available for further expansion and development
- Capacity to refine 100MT of Gold and 250MT of Silver annually, which can be scaled up to 250MT of Gold and 1000MT of Silver annually
- International standards manufacturing capabilities
- Refine gold and silver up to '999.9' purity
- High-tech integrated security systems
- Equipped with superior R&D capabilities
- Safety conscious and environment friendly unit
- Industry best quality accreditations
- Experienced management team & human resource
- A high quality ISO 17025: 2017 (NABL) accredited laboratory
- ISO 9001: 2015
- ISO 14001: 2015
- ISO 45001: 2018
- Scrap collection centers across India and gold jewellery recycling
- Coming soon with minting facility to produce quality range of gold/silver coins
- Approved Refinery for gold monetization scheme
- India goods delivery refinery



ICBC  Standard Bank

Our precious metals business offers a full spectrum of products, including physical offtake, financing and risk management.

ICBC Standard Bank is a precious metals clearer in the London market. We provide safe custody for physical bullion at our own vault and at market recognised vaults globally.

凤凰 Phoenix

Our innovative end-to-end solution allows clients to:

- view cleared balances, settlements and physical holdings**
- enter transfer instructions**

All in real-time, directly from their desk or handheld device.

To learn more email Ian.Harris@icbcstandard.com or go to www.icbcstandard.com



Sequel's FTWZ at Kandla & GIFT City



Long-term storage of
imported goods insulated
from duty fluctuations

Capacity to store substantial
quantities of gold and silver

Efficient inventory
management

Geographical proximity to
important manufacturing hubs

Lower total transaction

Duty exemption on re-export

500 Cities

57 Secure Hubs

22 High Grade Vaults

02 FTWZ



Commodities

Most trusted, oldest and secured transportation company in India. The Brinks Company is a leading global service provider of cash and valuables management, digital retail solutions and ATM managed services. Our network of operations in 52 countries serves customers in more than 100 countries.

Brink's India services for Valuable Management includes :

1. Vaulting/ Storage of High Value Goods
2. Air / Sea Booking and Transportation
3. Free Trade Warehousing Zone
4. Support and Regulatory Formalities
5. Domestic Distribution and Last Mile Delivery
6. Collection from Refinery and other vaulting agents



Program Schedule

Day - 1 : Friday, 28 April, 2023

THEME: India - The Regional Hub for Silver Bullion & Jewellery

1:30 pm onwards Room check-in for in-house guests & Delegate registration

2:00 pm - 3:30 pm Networking Lunch

3:30 pm - 4:30 pm **Master Class: Refining, Master-alloys & Electroforming**



Mr C Chandru
Hindustan Zinc Ltd



Mr Ankur Goyal
MMTC PAMP India Pvt Ltd



Ms Nishtashri Srinivasan
*Emerald Jewels
Industries India Ltd*

4:30 pm - 6:00 pm

Inaugural function



Shri Rajiv Arora
*Minister of State for Small
Industries and Exports,
Government of Rajasthan*



Shri Pramod Agrawal
*Chairman, National Gem &
Jewellery Council of India*



Mr Arun Misra
*CEO & Whole-time Director,
Hindustan Zinc Ltd*



Mr Michael DiRienzo
*Executive Director,
The Silver Institute*



Dr Chetan Kumar Mehta
*National Vice President,
IBJA*



Mr Chirag Thakkar
*Director,
Amrapali Industries*

6:00 pm - 6:15 pm

Felicitation of Sponsors

6:15 pm - 6:30 pm

Launch of Silver Survey and brief overview



Mr Chirag Sheth
Metals Focus

6:30 pm - 7:45 pm

Roundtable Discussion:
Issues & Challenges concerning Indian Silver industry

Moderator



Mr Chirag Sheth
Metals Focus

Panellists



Mr Tom Kendall
ICBC Standard Bank



Mr Gautam Choksi
Hindustan Platinum



Mr Chirag Thakkar
Amrapali Industries



Mr Manish Gavaskar
RBL Bank Ltd



Mr Shivanshu Mehta
MCX



Mr Kishore Choksi
Choksi Heraeus Pvt Ltd



Mr Vijay Murthy
Hindustan Zinc Ltd

7:45 pm - 10:00 pm

Cocktail Dinner @ Surya Vilas & Poolside

Day - 2 : Friday, 29 April, 2023

9:15 am - 9:30 am

Announcements

9:30 am - 11:15 am

Session 1: India silver jewellery & silverware:
Strategies to increase our presence in the global market

Moderator



Mr Avinash Gupta
Argentum Arts

Panellists



Mr Khun Kittisak Udom (Sam)
Thailand Silver Exporters Association



Mr Rahul Mehta

Silver Emporium Pvt Ltd



Mr Sanjay Agrawal
RV Agrawal Impex Pvt Ltd



Mr Krishna B Goyal
Dwarka Gems Ltd

11:15 am - 11:45 am

Networking Break Sponsored by AMS Bullion

11:45 am - 12:45 pm

Session 2: Silver investment demand:
Opportunities in bars / coins, silver ETFs, digital silver

Moderator



Mr Harshal Barot
Metals Focus

Panellists



Mr Rajesh Kapoor
Kundan Group



Mr Rajiv Ranjan
eBullion Pvt Ltd



Mr Vikram Dhawan
Nippon Life India Asset Mgmt Ltd
(Online)

12:45 pm - 2:15 pm

Networking Lunch

2:15 pm - 3:30 pm

Session 3: Latest technology updates in silver industrial applications

Moderator



Mr Ketan S Dhruv
Bangalore Refinery Pvt Ltd

Panellists



Dr Trevor Keel
Material Value Ltd



Mr Andre Christl
Heraeus Precious Metals



Dr. Amol A Kulkarni
*CSIR-National
Chemical Laboratory*



Prof. Parag Bhargava
*Indian Institute of Technology,
Bombay*



Dr. Subho Dasgupta
*Indian Institute of Science,
Bangalore*

3:30 pm - 4:00 pm

Networking Break Sponsored by AMS Bullion

4:00 pm - 5:00 pm

Session 4: Growing industrial demand for silver in India

Moderator



Mr Viraj Didwania
Foresight Bullion India Pvt Ltd

Panellists



Mr Murli Nikam
Modison Ltd



Mr Abhishek Jain
*Indian Solder and
Braze Alloys Pvt Ltd*

7:15 pm - 11:00 pm

Gala Cocktail Dinner @ Royal Lounge & Aravali Lawn

Day - 3: Sunday, 30 April, 2023

7:00 am - 8:30 am

Cricket Match (Optional)

8:30 am onwards

Networking Breakfast for in-house guests

11:00 am

Room check-out

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Inaugural Function

The India Silver Conference-2023 (ISC2023), the first of its kind to happen for the Indian silver industry was held in Jaipur from 28 to 29, April, 2023. The mission of this two-day conference was to discuss the key trends and developments in the Indian silver industry, and deliberate on possible solutions to ensure sustainable growth. The conference provided a great platform for silver jewellery manufacturers, industrial players, technology providers, academia, bullion dealers, banks, and logistics providers to share their insights and experience.



Shri Rajiv Arora

Highlights of the Inaugural Session at the India Silver Conference

Shri Rajiv Arora was the Chief Guest at the India silver conference. Shri Rajiv Arora is the Chairman of the Rajasthan Small Industries Development Corporation and Rajasthan Export Promotion Council with the rank of Minister of State, Govt. of Rajasthan.

Highlights of Shri Rajiv Arora's speech:

Silver denotes positivity and goodness, which also is a symbol of hope. In the Indian context, the state of Rajasthan contributes to almost 98% of Indian Silver production. Rajasthan has to its credit of being the largest manufacturer and exporter of silver jewellery, with the state contributing to about 50% of the total silver jewellery exports from the country. India is the epitome of silver artwork and jewellery, with a designated museum in Jaipur. Rajasthan is blessed with highly skilled manufacturing workmanship, which makes the state a preferred choice for silver jewellery manufacturing and sourcing destination. The government has established a helpline for the silver manufacturing industry to facilitate and promote trade and silver consumption. The industry should submit a memorandum to the central government for the reduction of basic customs duty on silver.



Shri Pramod Agrawal

Shri Pramod Agrawal was the guest of honour of the conference. Shri Pramod Agrawal holds the position of the Chairman of the National Gems & Jewellery Domestic Council of India. He was the past-chairman of the GJEPC.

Highlights of Shri Pramod Agrawal's speech:

Rajasthan has been home to reputed manufacturing units and showrooms due to its unique position in skill development and favourable policies. Rajasthan is credited for having the country's only Special Economic Zone for Gems and Jewellery industry. The National Gems & Jewellery Domestic Council, through its coordinated approach at various levels of the organisations, is playing a pivotal role in the overall development of domestic silver manufacturing. The sector is dynamic and growing steadily from the jewellery and industrial segments, thanks to organisations like IBJA. Indian industrial demand for silver is intact, given the level of industrialisation in the country, and price as a factor is not a hindrance to growing consumption.



Mr Arun Misra

Shri Arun Misra - CEO & Whole Time Director, Hindustan Zinc Limited, Vedanta Group

About Hindustan Zinc: Hindustan Zinc is the world's second-largest integrated producer of Zinc and 5th largest Silver producer in the world.

Highlights of the speech

India's appetite for silver dates back to 1800 BC, with silver coins reported to be in use in 600 BC. India consumes nearly 8000 tons of silver per year; the domestic production estimated at 700 tons, with HZL being the primary silver producer in the country. Most of the Silver mined and manufactured in India goes for jewellery making with minimal contribution from industrial applications. The industrial application of silver would be the next big happening in the consumption story. The policy governing the sector supports the industry's overall growth. India has tremendous potential for silver, and HZL aspires to play an important role in the development of the industry. Certain regions of Rajasthan along the Aravali region adjoining Gujarat holds huge potential for silver and other metals. The government of Rajasthan should free up exploration and prospecting and unleash the opportunity for growth in mining, and downstream industries.



Dr Chetan Kumar Mehta

Shri Dr Chetan Kumar Mehta, National Vice President- IBJA (India Bullion and Jewellers Association Ltd.)

Highlights of the speech

Silver has been used for centuries in jewellery as well as industrial applications. Silver represents purity, beauty, and strength. Silver offers a sustainable way to grow in these unprecedented times. Being highly malleable and ductile like gold, silver is a key component in electronic devices and other industrial applications like solar panels. Silver finds applications in photography, the manufacturing of battery cells, water purification systems, and more applications of daily use. IBJA invites all participants to become members of World Silver Council. Also, IBJA invites all the silver jewellery and silverware manufacturers to join the Silver Show scheduled between 8 and 11 June 2023.



Mr Michael DiRienzo

Shri Michael DiRienzo – Executive Director of The Silver Institute

Highlights of the speech

The Silver Institute is a global industry association that celebrated its 50 years of existence. The main objective of the institute is to develop markets and products for silver. The institute also comes out with periodic reports on silver like Annual Silver Survey and a bi-monthly magazine. India Silver Conference has served the purpose of bringing in industry participants of various spectre. The world knows India is one of the major players in the silver industry, with the Institute looking forward to playing a proactive role.



Mr Chirag Thakkar

Shri Chirag Thakkar- Director, Amrapali Industries, Gujarat.

Highlights of the speech

Amrapali is one of the largest gold and silver bullion dealers with a pan-India presence. The group runs one of the first BIS-accredited refineries in the country and has recently added a digital platform to the list of its offerings. India is being looked at as a key market driver for silver. At the LBMA 2022 Annual Conference last year, the Indian silver market growth story was the main topic. India had a significantly good import, which peaked from July to October. The higher volumes had come against high price volatility. India's annual demand for silver is approximately 6000 tonnes, with the material being imported through designated banks in the form of bullion.

The consignment model for bullion imports has worked seamlessly over the past two decades. The recently launched IIBX has huge potential and can be used to transport and buy bullion across India. There is a need to reduce the import duty on bullion as it hampers the trade across the supply chain, especially for manufacturers and refiners.



Day 1: Master Class: Refining, Master-alloys & Electroforming

The first session that kick-started the inaugural India Silver Conference was on **Refining, master alloys, and Electroforming.**



Speakers: Mr C Chandru, IBU CEO, Hindustan Zinc.

Mr Ankur Goyal, President Works, MMTC PAMP India Private Limited,

Ms Nishtashri Srinivasan, Director, Emerald Jewels Industries India Private Limited.



Mr C Chandru

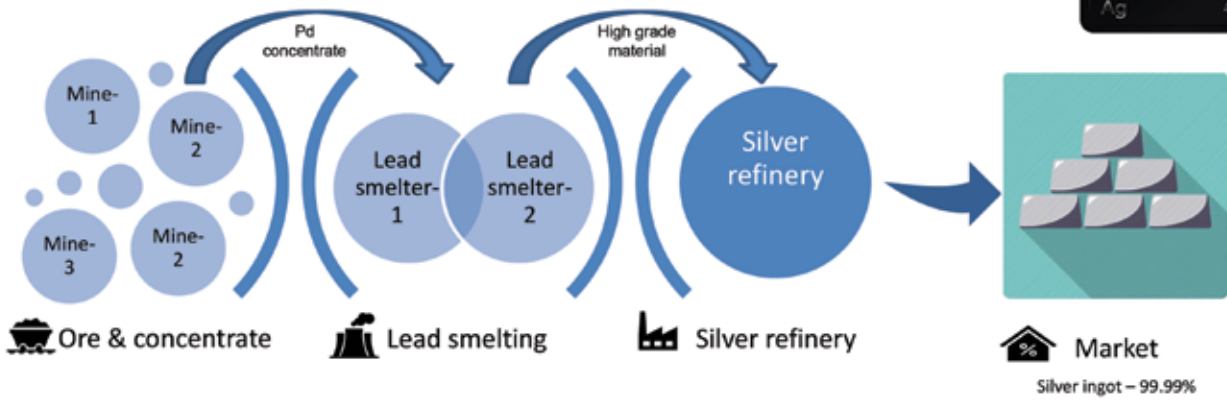
The first session that kick-started the inaugural India Silver Conference was the session on refining, master alloys, and Electroforming which had three speakers who were Mr C Chandru, IBU CEO of Hindustan Zinc smelters based at Udaipur. Followed by Mr Ankur Goyal, President Works, MMTC PAMP India Private Limited, and the last speaker in the panel was Ms Nishtashri Srinivasan, Director, Emerald Jewels Industries India Private Limited.

Mr C Chandru, IBU CEO of Hindustan Zinc Smelters based at Udaipur, His presentation mainly revolved around the refining operations at Hindustan Zinc Limited. The main focus of this would be relating to the refiners at Hindustan Zinc Limited. Once the silver is retrieved or extracted from the mine it is transferred to a lead or zinc concentrate which is then shifted to the lead smelters where silver is in the form of a by-product or residue, which is then sent to the refinery located in Uttarakhand where the inputs are handled in two different stages. The following three slides show us the whole process in a systematic way.

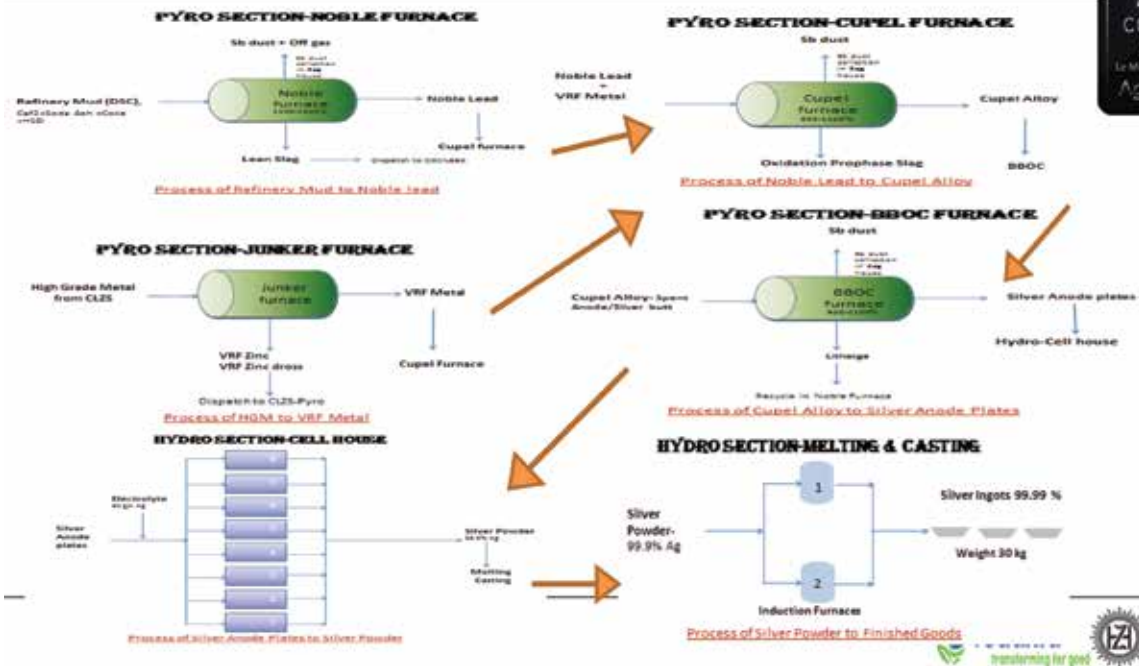
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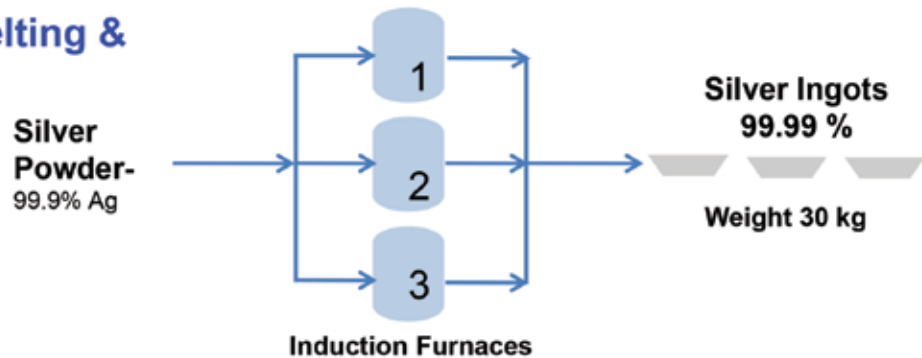
Silver flow from ore to market



28-30 April 2023 @ Le Meridien Resort & Spa, Jaipur



Hydro Section-Melting & Casting



Process of Silver Powder to Finished Goods



Mr Ankur Goyal

Mr Ankur Goyal, President Works, MMTC PAMP India Private Limited was the second speaker on the panel who spoke about silver master alloys and their various applications in the industry. The first part of the presentation was the introduction of MMTC PAMP and the basic concept of master alloys, the second part of the presentation was the Refining of silver which includes two main procedures which are electro-refining and chemical refining. Electro-refining is a process where the dore is converted to anodes which are electrolyzed to form crystals, these crystals are put into a melting tunnel furnace where the 999.99 pure silver is produced. Whereas chemical refining is a process involving silver dissolving in nitric acid where the cementation of silver chloride by dextrose gives us the final silver bar. The last section of this presentation was about master alloys, a particular type of alloy designed to be added to pure metal, in our case gold or silver, to modify its characteristics. Master Alloys is available to produce gold of a variety of colors e.g. Yellow Gold, White Gold, Rose Gold, Green gold, etc. The main characteristics and applications of these master alloys are detailed in the picture as shown alongside.

Range of Master Alloy in MMTC-PAMP



996.2ZK YELLOW GOLD CASTING ALLOY					
CODE	COLOR	KT	APPLICATION	Ag%	SPECIAL COMMENTS
9WY004	Rich Yellow	9.24K	Casting	21.00	Good Luster, High Reusability
9WY014	Bright Yellow	9.24K	All purpose	13.50	Economical, Good Shine
9WY040	Red Yellow	9.24K	All purpose	13.00	Good Luster, Good Workability
9WY027	Rich Yellow	9.24K	Mechanical	19.75	High Performance, Good Shine

996.1BK YELLOW GOLD CASTING ALLOY					
CODE	COLOR	KT	APPLICATION	Ag%	SPECIAL COMMENTS
9WY003	Yellow	9.4K	Casting	20.00	Good Luster & Reusability
9WY005	Rich Yellow	9.8K	Casting	20.50	Good Luster & Reusability

996.1BK YELLOW GOLD CASTING & MECHANICAL ALLOY					
CODE	COLOR	KT	APPLICATION	Ag%	SPECIAL COMMENTS
9WY003	Deep Yellow	9.8K	Casting	48.50	High Performance & Luster
9WY034	Deep Yellow	9.8K	Casting	47.00	Reusability, Good Shine
9WY039	Rich Yellow	9.8K	Casting	51.00	Excellent Workability & Shine
9WY037	Mid Yellow	9.8K	Mechanical	53.00	Room for Bangladeshi, Good Shine

996.2ZK YELLOW GOLD CASTING & MECHANICAL ALLOY					
CODE	COLOR	KT	APPLICATION	Ag%	SPECIAL COMMENTS
9WY014	Yellow	9.8K	Casting	26.00	Good Luster, Good Flexibility
9WY016	Deep Yellow	9.8K	Casting	26.00	Good Luster, Good Flexibility
9WY024	Yellow	9.8K	Casting	38.00	High Performance, Low Loss
9WY028	Deep Yellow	9.8K	Casting	36.00	High Performance, Low Loss
9WY029	Greenish Yellow	9.8K	Casting	42.10	Reusability, Tarnish Resistant
9WY028	Greenish Yellow	9.8K	Casting	44.00	Reusability, Tarnish Resistant
9WY029	Greenish Yellow	9.8K	Casting	44.00	Hard with good surface luster
9WY044	Reddish Yellow	9.8K	Casting	37.00	Economical, High Reusability
9WY045	Reddish Yellow	9.8K	Casting	37.00	Economical, High Reusability
9WY023	Light Yellow	9.8K	Casting	2.00	Good Shine, Economical
9WY026	Deep Yellow	9.8K	Casting	2.00	Good Shine, Economical
9WY009	Reddish Yellow	9.8K	Mechanical	18.00	Economical, Good Shine
9WY019	Reddish Yellow	9.8K	Mechanical	18.00	Economical, Good Shine
9WY019	Yellow	9.8K	Mechanical	20.00	High Performance, Good Shine
9WY024	Yellow	9.8K	Mechanical	20.00	High Performance, Good Shine
9WY040	Yellow	9.8K	All purpose	30.00	High Performance & Reusability
9WY040	Yellow	9.8K	All purpose	30.00	High Performance & Reusability
9WY040	Yellow	9.8K	All purpose	30.00	High Performance & Reusability
9WY040	Yellow	9.8K	All purpose	30.00	High Performance & Reusability

996.1BK WHITE GOLD CASTING & MECHANICAL ALLOY					
CODE	COLOR	KT	APPLICATION	Ag%	SPECIAL COMMENTS
9WY006	Mid White	9.8K	Casting	4.00	High Flexibility, Stone in Place
9WY007	Mid White	9.8K	Casting	15.00	Stone in Place, Good Whiteness
9WY003	Off White	9.8K	Casting	20.00	Low Nickel, High Reusability

996.1BK WHITE GOLD CASTING ALLOY					
CODE	COLOR	KT	APPLICATION	Ag%	SPECIAL COMMENTS
9WY006	Mid White	9.24K	Casting	5.00	Low Silver, Soft Reusability

996.1BK PINK GOLD CASTING & MECHANICAL ALLOY					
CODE	COLOR	KT	APPLICATION	Ag%	SPECIAL COMMENTS
9WY013	Deep Pink	9.8K	All purpose	4.45	High Reusability & Workability
9WY063	Pink	9.24K	Casting	6.00	Medium Silver, User Friendly
9WY064	Light Pink	9.24K	Casting	13.00	High Silver, Low Dr-on
9WY065	Pink	9.24K	Casting	4.50	Suitable for Stone in Place
9WY069	Light Pink	9.24K	Casting	6.50	High Reusability & Workability
9WY069	Deep Pink	9.24K	All purpose	4.50	Excellent Workability, Low Silver
9WY063	Pink	9.24K	All purpose	6.00	Low Silver, European DIN Color
9WY013	Light Pink	18.21K	All purpose	18.00	Good for Sheet, Wire, High Silver
9WY013	Pink	9.24K	Casting	20.00	User Friendly, Good Reusability
9WY019	Pink	9.24K	Casting	20.00	Good Workability & Reusability

925 STERLING SILVER ALLOY					
CODE	COLOR	PURTY	APPLICATION	Cu%	SPECIAL COMMENTS
9WY001	Ultra White	925	Casting	61.00	Tarnish Resistant, High Dr-on
9WY002	White	925	Casting	67.00	Economical, High Flexibility
9WY003	White	925	Mechanical	62.00	Tarnish Resistant, Good Dr-on
9WY004	White	925	Mechanical	58.00	Spring Hard Alloy, Anti Tarnish
9WY005	White	925	Casting	76.00	High Performance & Reusability
9WY007	Super White	915	All Purpose	63.00	High Flexibility & Anti Tarnish, Dr-on

MASTER ALLOY

Alloys for Yellow, Pink & White Gold Alloy for Casting Sites
Application: Gold and Silver Jewellery
Properties: Usage of 999.9+ Silver in alloy reduces casting issue and metal loss.



SILVER ANODE

Min. 999+ Silver Purity
 Dimension: Length Max. 600 mm
 Width 25 - 150 mm
 Thickness 1.5-6.0 mm
Application: Electroplating
Properties: Uniform Plating, Low Return to 25 Spec (IS 3104:2017)



SILVER POWDER

Min. 999.9+ Silver Purity
 Dimension: upto 10 Micron Size
Application: Electrical Contact, Solids, Paste, Medicines, Plating
Properties: Consistent Quality, High Flexibility, Increased Conductivity



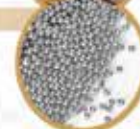
STRIPS, WIRES & RODS

Gold: 1. Fine Gold Min. 999+ Purity
 2. Alloyed Gold 9K to 21K Karat
 Silver: 1. Fine Silver Min. 999.9+ Purity
 2. Alloyed Silver Sterling (925, 800+ Purity)
Application: Jewellery, Findings, Accessories
Properties: Uniform Color



SILVER GRAINS

Min. 999.9+ Silver Purity
Application: Jewellery, Button
Properties: Uniform Size, Zinc Oxidation & Impurity Content as per ASTM B413-97a(2017)





Ms Nishtashri Srinivasan

Ms Nishtashri Srinivasan: Ms. Nishtashri Srinivasan, Director, Emerald Jewels Industries India Private Limited who was the final speaker in the panel spoke about the process of electroforming which included the basic meaning, followed by the briefing of the whole process involved in electroforming, and the benefits of using electroforming products.

The Benefits of **Electroforming** Products

- We can produce jewellery/idols which are large in size but light in weight
- Complex 3D articles can be made employing this technology with high dimensional accuracy.
- Hard and durable statues & jewellery products with 0.1-0.6 mm thickness.
- Our 15 Years of experience gives us the edge to produce products of absolutely any thickness
- We make EFM products in both a dull & High Shine finish with good strength



Process Flow of **Electroforming**

- Jigging
- Cleaning Process :
 1. Electrolytic Cleaning
 2. Acid Dip Cleaning
- Forming Process :
 1. Electroforming Process
- Mandrel Removing or Emptying process



ELECTROFORMING PROCESS

- A unique feature of the electroforming process is that the silver grows over the Mandrel atom by atom and this process imparts absolute accuracy and high aspect ratio.
- In Electroforming, thickness ranges from 100 micron to 600 Micron.
- The solution or bath contains the required silver metal in the form of Salts.
- The process continues until the required thickness is achieved by maintaining optimum level of bath contents & operating parameters.
- Operating the bath is complicated and continuous monitoring is required while the silver idol is forming.
- Maintenance of chemical parameter is essential to control rejections and ensure surface quality.
- In Silver electroforming we can produce a wide variety of products like Idols, Jewellery, Lamps, Garlands, Gift articles etc.

Questions from the audience-

Mr Abhishek Jain to Mr Ankur Goyal- Is Cadmium being explored or used in the making of Master-alloys?

No, it is not used in the making of master alloys as it is toxic and cancerous in nature which is also banned by the government of India. We use substitutes like copper or zinc instead of cadmium.

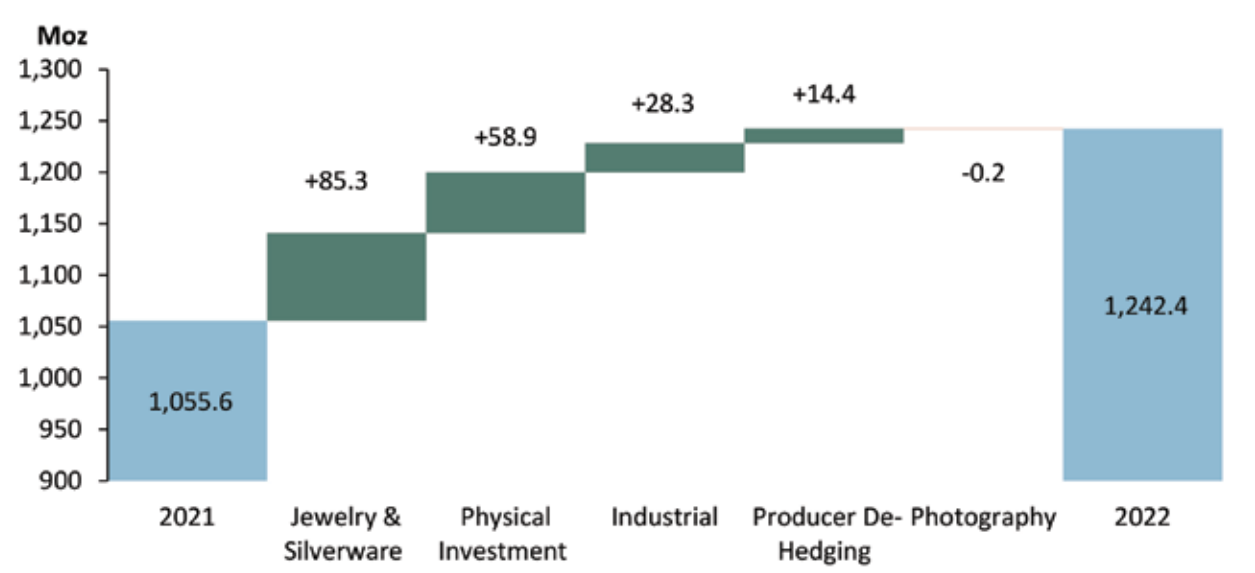
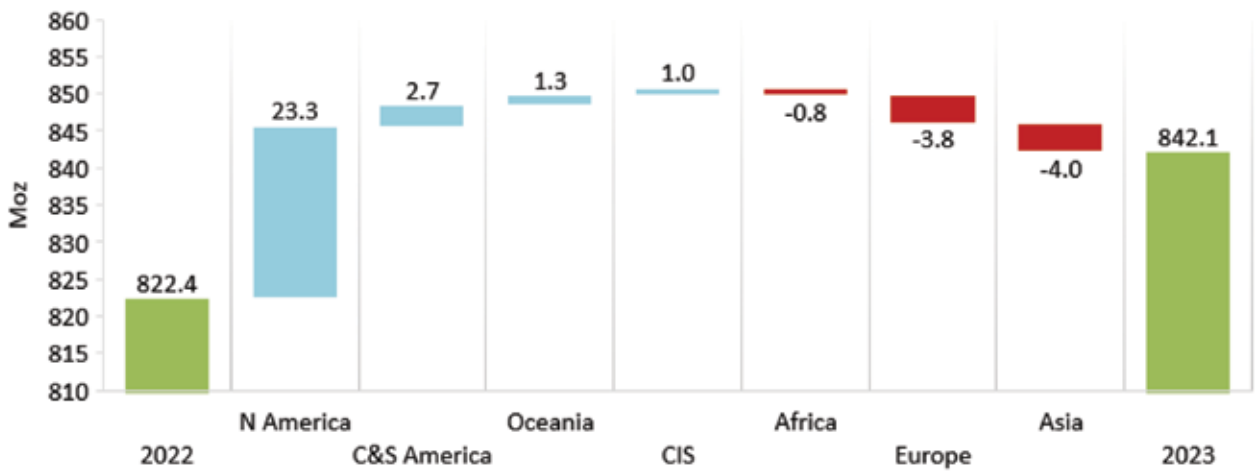
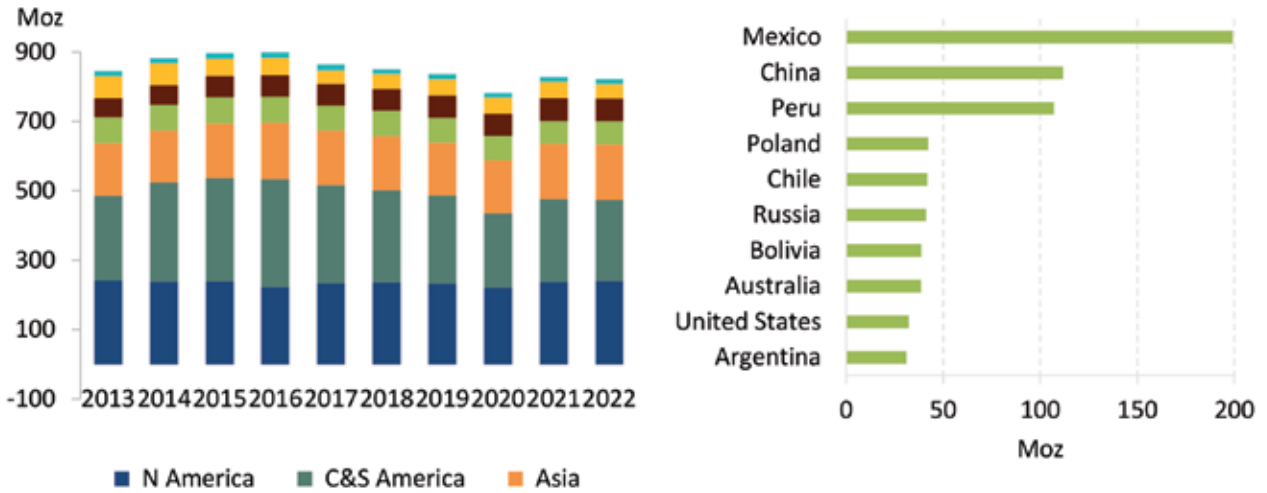
Mr Kishore Choksi to Mr Ankur Goyal - As stated in your presentation, one cannot achieve high purity levels through chemical refining. What do you think is the reason for this?

In the case of electro-refining the anodes are covered with an anodic bag which restricts the flow of impurities, thus giving a higher purity content. But, in the case of chemical refining the whole manufacturing process should be monitored to obtain a higher purity percentage.

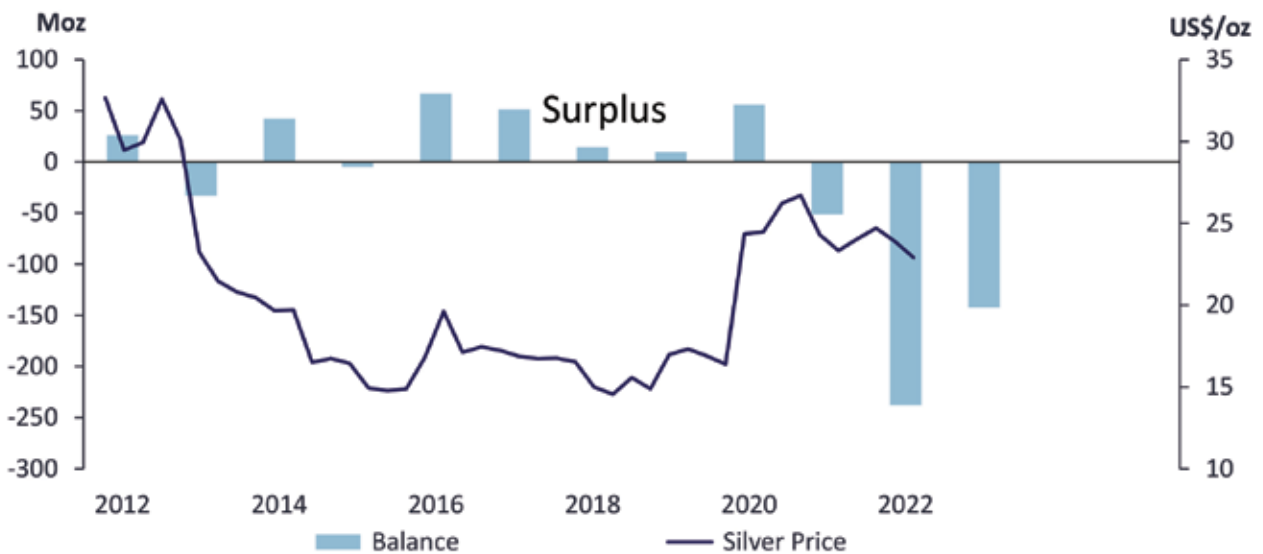
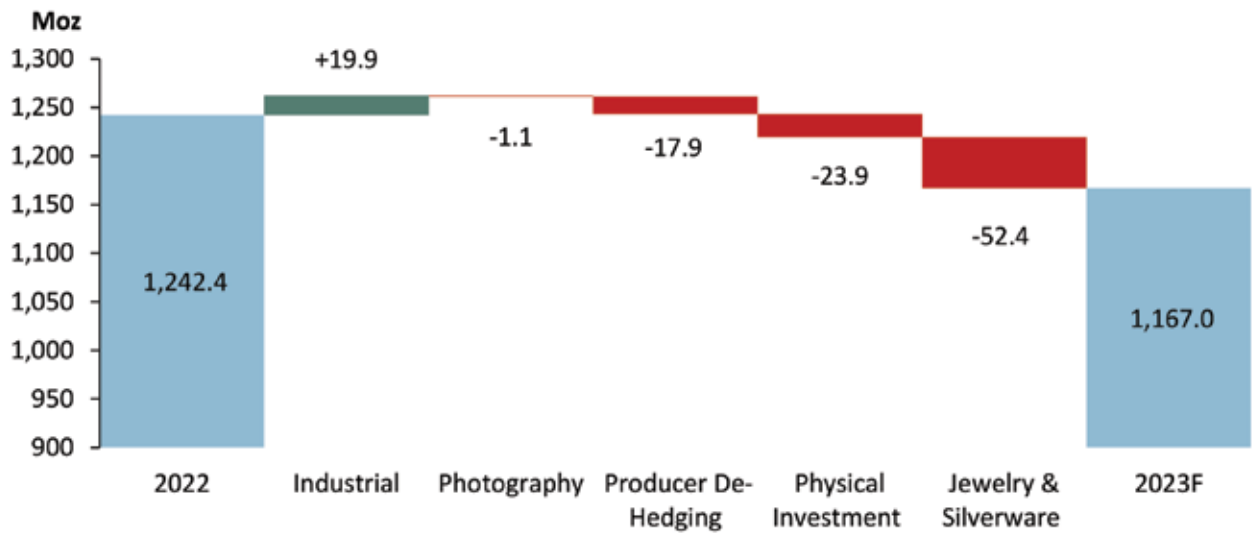
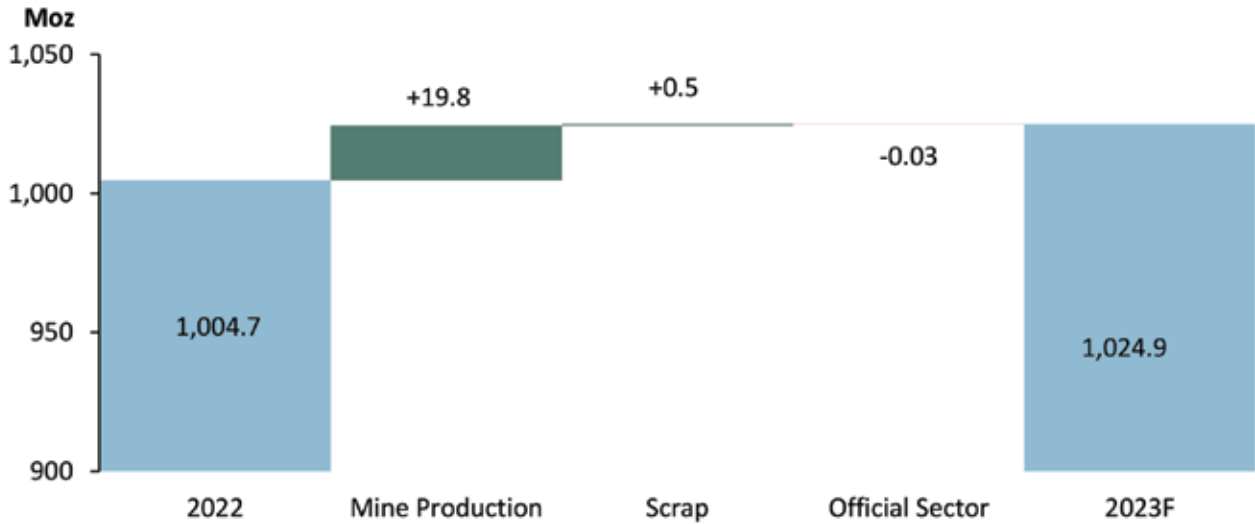


Launch of World Silver Survey 2023

Mr Chirag Sheth, Principal Consultant, Metals Focus



PROCEEDINGS OF INDIA SILVER CONFERENCE, 28-30 APRIL 2023



Day 1: Roundtable discussion- Issues and Challenges Concerning Indian Silver Industry



Session moderator: Mr Chirag Sheth - Metals focus
Panelist

Mr Thomas Kendall, ICBC Standard Bank, **Mr Gautam Choksi**, Hindustan Platinum
Mr Chirag Thakkar, Amrapali, **Mr Manish Gavaskar**, RBL
Mr Shivanshu Mehta, MCX, **Mr Kishore Choksi**, Choksi Heraeus,
Mr Vijay Murthy, Hindustan Zinc Limited.



Mr Chirag Thakkar

Moderator: What has changed in the silver market in recent years? According to you, what can be the major reasons for the drive in demand?

Mr Chirag Thakkar: With silver prices relatively lower than gold prices, many retail and small investors shifted their focus from gold to silver a few years ago. Post 2011, demand for silver has been increasing at a gradual pace. With silver finding more usage in various applications like artefacts, silver jewellery, and silverware, silver imports have been stable throughout. The demand story for silver has been steadily growing with the same to remain in the years to come.

Moderator: ICBC Standard Bank is the biggest supplier of silver to India. As a foreign bank, how do you manage the volatility in demand and mitigate the risk involved in trade with countries like India? Can you also brief about the demand for silver originating from India?



Mr Tom Kendall

Mr Thomas Kendall: ICBC Standard Bank, the strength of being one of the largest silver bullion banks globally, helps navigate market hindrances like volatility in demand, etc. If demand is low in India, creative and innovative approaches will help in overcoming them.

Adapting and reacting quickly to market sentiments helps to take informed calls. ICBC Standard Bank's presence throughout the value chain helps it manage the situation's adversity giving them various options to choose from.

In India, silver is mainly used for jewellery or other applications, and the requirement is mainly in physical form rather than digital. The Impact arising from the demand side in India provides a kind of floor for silver prices.



Mr Manish Gavaskar

Moderator: Being one of the most prominent banks in the Indian silver market, why are the banks not playing an essential role as they do in the gold market?

Mr Manish Gavaskar: India, on average, imports 6000 tonnes of silver. Imports have been gradually increasing since 2013 when most investors looked for alternatives to gold making silver a viable and comparatively cheaper option to gold. Holding physical silver in the form of Kg bars is very difficult, which is not the case in gold. The major role of Indian banks with reference to silver is to provide consumers with digital options in silver, like ETFs, where any investor can hold a pocket size. Indian banks are striving to provide product innovations like arbitrage, hedging options, and funding, giving a distinct role to the banks as it is supposed to be.



Mr Gautam Choksi

Moderator: We have seen that the government of India has focussed on Silver manufacturing for the past couple of years. Many semiconductor and mobile manufacturing factories are being set up. How does it affect Hindustan Platinum and Choksi Heraeus, as they are prominent players in the Silver industry? In addition, does the increase

in silver prices hurt its usage in industrial applications?

Mr Gautam Choksi: Industrial demand for silver is rising, whether for photovoltaic applications or in the use of EVs, making it better for manufacturing units in India. The main effect depends on how much of this demand is catered by the Indian manufacturers. There is an inverted duty structure in India for silver, making it a lot more difficult as the price of bullion import would be much higher than the import of silver salts and silver paste.

Mr Kishore Choksi: The inverted duty structure that exists should be rectified. The duty structure on electrical contacts is significantly lower than that on the metal. This anomaly does not create a level playing field between domestic manufacturing and imports. To rectify this, the import duty structure on contacts should be brought on par with that of the silver.

The rise in silver prices can hurt the industrial application industry as more silver is used, which makes it costlier for the manufacturer to purchase. However, there are innovations that are set in place for reducing the silver content in these applications.

Moderator: Hindustan Zinc Limited is the 5th largest producer of silver in the world. The company has a target of 1,000 tonnes of silver production. What are the measures taken to complete this self-set target?

Mr Vijay Murthy: Hindustan Zinc is on course to achieve the target of 1000 tons of silver in the next few years. For 2022, Hindustan Zinc managed to produce 714 tonnes of silver, and the projection for 2023 is 750 tonnes. Coming to the target of 1000 tonnes per year, one of the top mines is being explored to find rich silver content, which will help the company realize this goal. At the same time, there are varieties of obstacles that must be overcome to achieve this goal.



Mr Kishore Choksi



Mr Vijay Murthy

Moderator: MCX is considered one of the top global exchanges in the market. In the past year, MCX has introduced new products like the right options and Bullion index; how does this help the mid/small size players in the Indian market?

Mr Shivanshu Mehta: As a leading market infrastructure institution, it is the duty of MCX to provide the necessary support to the physical players. For silver which is both a precious and an industrial



Mr Shivanshu Mehta

metal, the exchange has launched various contracts that are traded on the exchange. To mention futures, options, and indices. These contracts can cater to all the uncertainties like the disparity of discount and volatility. Over the past year, records have shown that silver futures are one of the most traded contracts in the world. These contracts must only be used for hedging and not for speculating. Hedging instruments help keep the asset safe from any imbalances caused by volatility.

Questions from the audience.

Question- Where do you see the bullion tech market, especially digital gold and silver, in the near future?

As the demand and popularity for digital silver and gold markets grows, it becomes a more viable option for bankers as there is a growing trust amongst retailers in India making it a good investment and hedging option for all the value chain participants.

Question to Mr Kishore Choksi: Since Choksi Heraeus is an industrial manufacturer, what strategy would you advise a price-sensitive consumer given the price fluctuations that happen intraday?

Primarily Choksi Heraeus deals with customers who are mainly focused on the quality of the product. We offer various price options, like the average of the month or the opening and closing on a particular day based on the consumer. Fixing the price of silver with the buyer is a must to eliminate price fluctuations.

Question to Mr Shivanshu Mehta- Can you briefly explain how the two exchanges, MCX and IIBX, will work together in the coming times?

IIBX is a national project and is a vision of the government. It is under the regulation of IFSCA. IIBX is considered a gateway for gold imports into the country. MCX on the other hand is a domestic platform mainly used for hedging purposes. MCX caters to three types of risks – Commodity price risks, currency risks, and risks arising from change of customs duty. There will be integration in the future between these exchanges, which will benefit the whole bullion industry.



Day 2: Session 1- Indian Silver jewellery, silverware, and the strategies to increase its presence in the global market.



Session moderator: Mr Chirag Sheth, Principal Consultant, Metals Focus

Speakers:

Mr Khun Kittisak Udom, President, The Thailand Silver Exporters Association

Mr Avinash Gupta, Argentum Arts, **Mr Rahul Mehta**, Silver Emporium,

Mr Krishna B Goyal, Dwarka Gems Ltd.



Mr Khun Kittisak Udom

Presentation by Mr Khun Kittisak Udom (SAM)

The presentation gave insightful information about Thailand's silver exports. He highlighted the work done by the Thailand Silver Exporters Association along with the roles and responsibilities of the association. Finer details like major exports, the export value of silver jewellery, the major customers of silver jewellery from Thailand, and many more aspects.

28-30 April 2023 @ Le Meridien Resort & Spa, Jaipur



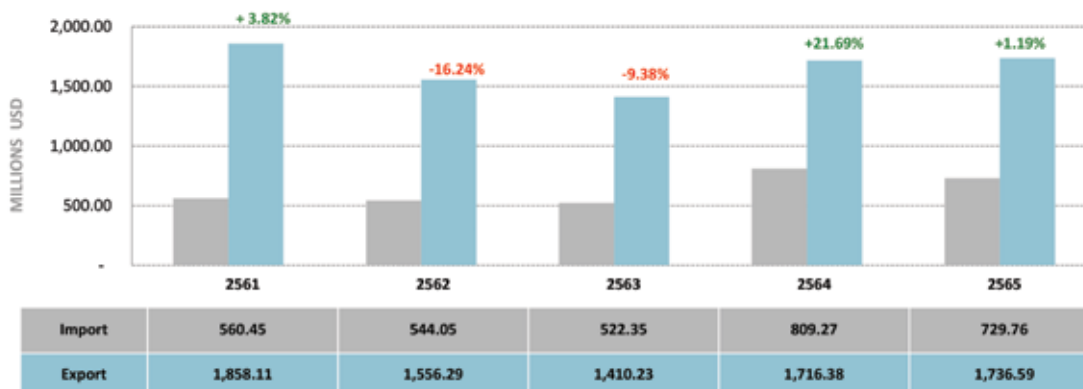
Silver Jewelry accounts for 11.50 % of total export value in 2022.



28-30 April 2023 @ Le Meridien Resort & Spa, Jaipur



Comparison between importing value (raw material) and exporting value (finished products)



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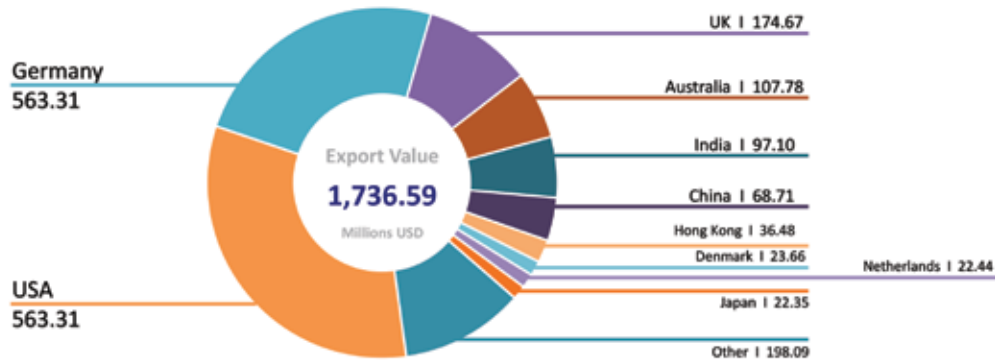
Thailand's silver jewelry export value 2013-2022



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Major Customers of Thailand's Silver Jewelry in 2022



28-30 April 2023 @ Le Meridien Resort & Spa, Jaipur



Silver Jewelry Export from Thailand to India 2018-2022



Moderator: What is your opinion on the growth and evolution of the silver jewellery market in recent years? Is silver jewellery demand mainly because of the elevated gold prices, or is it a structural shift from gold to other precious metals?

Mr Krishna Goyal: The Indian market has gone through an evolution in the past 10-15 years; with the upgrade in craftsmanship, demand for designer jewellery has picked up. Gemstones have brought creativity to silver jewellery, which has helped in domestic consumption and global exports. Initially, the shift to silver was mainly because of the elevated gold prices eventually, the variety and dexterity of silver jewellery designs took over consumer preference making it a very popular means of jewellery in India.



Mr Krishna Goyal

Moderator: Silver Emporium is one of the largest silverware manufacturers. Manufacturing silver-based products need craftsmanship expertise. Regarding this, what is your view on the silverware market compared to the jewellery market?

Mr Rahul Mehta: The silver jewellery market has scaled much faster compared to the silverware market. India's population is one of the largest in the world, which helps to drive the silverware demand as most Indian households use silver which will eventually help the silverware market flourish.



Mr Rahul Mehta

Moderator: Does the Thailand Exporters Association have any promotion or marketing strategies in place for the consumers of silver jewellery in Thailand?

Mr Khun Kittisak: Yes, it is essential for promoting domestic consumption. The Thailand Exporters Association organises various domestic exhibitions to promote new brands and designs to attract consumers. The growing awareness of these designs, especially on the online platform, has picked up since the start of Covid-19, which makes silver jewellery an interesting prospect for the domestic consumers of Thailand.



Mr Avinash Gupta

Moderator: A lot of jewellery and silverware in the market is about 60-70% pure which is not known by the public. Why are there no industry initiatives for the awareness of purity?

Mr Rahul Mehta: With respect to awareness of the product World Gold Council has provided an excellent platform to educate the public, but we at silver emporium have been trying to do our best as well. Considering most of the silver karigars are small entities that have less knowledge about what alloys to use makes it more difficult to provide the standard purity which is required. Thus if a link is created between the karigars to provide them with the appropriate knowledge required would be helpful for the silver industry.

Moderator: Why is there no marketing done for silver as it is done for the gold jewellery segment?

Mr Avinash Gupta: Coming to the marketing part, majority of the silver retailers do not have any specific silver jewellery and artifacts. However, this is changing from the past two years as there are several stores dedicated only to silver. The marketing will start on the individual level which will lift the sales of both jewellery and artifacts.

PROCEEDINGS OF INDIA SILVER CONFERENCE, 28-30 APRIL 2023

Moderator: How can the silver industry keep up with the newer generation and trends of the modern era?

Mr Krishna Goyal: There is a good opportunity in this target market, Dwarka Gems has instilled new designs and custom-made designs to fit the needs of retailers as the new generation wants something unique. The Ad-campaigns and marketing through social media will help us in facilitating and educating the younger generation.

Moderator: Most of the exports from India for silver jewellery have reduced. Is there a particular reason for this decline in exports?

Mr Krishna Goyal: The silver export market being competitive there is always an alternative to a manufacturer in the market. The availability of duty-free metal can help with exports. As the duty is 15% in India and 5% elsewhere doesn't help the cause. Thus, the government must come up with a remedy for this problem.

Questions from the audience.

What is the enticement behind organised players in the silver retail market to put up separate outlets/segments for silver jewellery and silverware?

Mr Avinash: The unorganised players often sell low-quality silver, which has a lesser percentage of pure silver to the consumers. More over the Indian consumer lacked knowledge about the purity aspects of silver. This was considered one of the motives for organised players to enter the segment.

The organised players set a standard for the purity of silver content to benefit the consumers.

How should one strategize to keep the consumer's reliability and trust through e-commerce websites and social media? How to develop a sense of trust amongst the consumers about the product.

Mr Rahul Mehta: Social media promotion, availability of all the products on the company's websites, company's visibility throughout all the platforms play a huge role in the trust that builds upon the consumer for a particular product.

Silver Emporium has organised road shows to educate consumer about hallmarked jewellery and the importance of hallmarking. Thus providing knowledge about your brand and product is necessary for today's market, which will give the consumers awareness and trust.

What is your view on the use of cadmium in the silver industry? How to overcome this difficulty, as cadmium is harmful to the people involved in the manufacturing process?

Mr Krishna Goyal: The unorganised players in the silver market mostly use Cadmium as a substitute for zinc or copper. Making it mandatory to not use cadmium can be one of the ways to eradicate the use of cadmium as an alloy. Most of the organised players use ready-made alloys of zinc or copper, which can be one of the solutions not to use cadmium.



Day 2: Session 2- Investment landscape, opportunities provided by digital options and silver ETFs.



Session moderator: Mr Harshal Barot, Metals Focus

Speakers:

Mr Rajesh Kapoor, VP, Business Development, Kundan Group

Mr Rajeev Ranjan, Business Lead, ebullion Pvt. Ltd, Mr Vikram Dhawan, Nippon India AMC (Online)

Mr Rajeev Ranjan provided a holistic roadmap for the Indian Silver ecosystem and gave insightful information about the asset's intrinsic value. He emphasised on benefits of digital silver and how it maps all mobile users. He paved the road ahead for silver by ONDC and bullion tech, elaborated in the slides below



Mr Rajiv Ranjan

28-30 April 2023 @ Le Meridien Resort & Spa, Jaipur



Digital Silver is all about returning the shine to Physical Silver

- Physical silver's intrinsic value as an asset derives from multiple uses:
 - **Store of value** [an affordable mode of storage especially in hinterlands due to its low unit value, and hedge against inflation/currency depreciation, source of instant liquidity]
 - **Exchange of value/** payment systems [First coins minted in 800 BC ->Silver Standards-->Silver backed block-chain stablecoins]
 - Industrial and other applications from **silverware to solar panels**
 - **Investment** [portfolio diversification, limited supply leading to a steady appreciation]
- The Indian demand for silver assets is impaired for all of these uses:
 - **Store of value** [Rising crime rates and storage costs are creating a disincentive for holding physical assets, while large haircuts on buy-backs erode value]
 - **Exchange of value** – The embedded value in Silver cannot be exchanged for other goods and services.
 - Industrial use of silver is on the rise in India. However, the supply chain faces several logistical challenges leading to large working capital investments
 - Investments [Commendable growth in **ETF Aum in 2022 and, MCX India** notwithstanding, **traction is still limited to urban financial investors**, while physical investment demand may be in **T2/T3 cities and rural areas.** , Pricing and purity concerns remain alleviated]





Digital Silver's intent is to increase the uses of Silver for its holders

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Digital Silver – An asset is what an asset does

The Digital Silver addressable market can be mapped to mobile –users

- Store of value** 
 - **24/7 liquidity** akin to Physical metal but without the melting charge and market hour restrictions.
 - **Securely stored** in an independent third-party vault, thus removing storage risk.
 - **Clearing house type settlement** – Customer funds are retained in an escrow account till the metal is delivered
 - **100 percent metal pooled allocated ownership with bankruptcy planning** – Customers receive a legal title in the underlying large bars, while custodial agreements provide for smooth distribution of the customer segregated assets in case of a liquidation event for the customer.
 - **Purpose built for micro-savings** due to low ticket size and near-zero administrative overheads
 - **Zero asset risk on account of purity as only Good Delivery refiner bars will be used and vaulted sales prevent a break in the chain of integrity**
- Exchange of value** 
 - Customers can monetize their metal balances against the purchase of goods and services from partner outlets. While this feature is being used for the **procurement of jewelry, bars, and coins.**
 - Redemption journeys developed by Google Pay, and Phonepe is finding end-user acceptance.

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Digital Silver enabling investments in Silver – The road ahead

Digital Silver will find traction as it retains the best of physical silver while removing the difficulties of owning the same.

- **Bringing the horse to well** – accessibility to mobile devices users rather than to DMAT accounts or mutual fund account holders. This market is increasing exponentially.
- **Bullion Tech** : Its going to stay with increasing uses of trusted digitally held physical silver, not just for savings but to seamlessly purchase other goods
- **ONDC (Open Network for Digital Commerce)** : Grew manyfold since inception and Digital Silver becomes more accessible.
- **Securing metal and asset governance is key-** No compromise on customer assets: metal or funds
- **Tax friendly investment** : LTCG benefits along with the benefit of Indexation (after 3 years)



Mr Rajesh Kapoor

Mr Rajesh Kapoor: Kundan Group have been in the bullion industry for the past two decades. On digital investment, there is good demand as the knowledge of the product has been increasing. Silver is more affordable, and the surge for silver coins on e-commerce websites has picked up recently, giving us a good indication of the digital platform.

Mr Vikram Dhawan, Nippon India AMC, Delivered insightful information about the mutual fund sector / ETFs' various costs involved in ETF pricing. Speaking on digital platforms, the focus was on the user-friendly nature of the product, which everyone from anywhere in the world can use. Regarding charges, he insisted the consumer should be aware



Mr Vikram Dhawan

of these charges beforehand as they can vary from one platform to another, as the transaction charges are generally high.

In the case of silver ETFs the expense ratio and impact cost play a vital role. ETFs strive to provide a cost-effective method to invest in precious metals, considering the costs involved and the safety provided by ETFs can be considered as one of the best modes of investment. The global AUM for silver ETFs is almost 24000 tonnes which shows how widely it is recognised by the investment market. In conclusion, these products have been the best innovation of the century.

Question to Mr Vikram Dhawan and Mr Rajeev Ranjan: What are the challenges digital platforms face in context with ETFs and the price discounts we see in Silver?

As per SEBI guidelines, silver ETFs must be backed by physical silver. The Indian ETFs essentially track the local spot market, meaning if there is any discount or premium in the spot, it will also reflect on the ETFs, whether gold or silver. It removes the possibility of arbitrage as well.

Ebullion Pvt Ltd has tie-ups with global service providers who give us real-time information about the price, making it easier to set the Indian price according to the customs duty. At the same time, some overheads are involved in physical bullion, which is not the case for digital investment methods like ETFs or Digital gold/silver.

Question to Mr Rajesh Kapoor- Coming to the Jewellery segment which has a lot of issues regarding purity and hallmarking. As a refiner do you see this as an opportunity to address and tackle these issues?

We at Kundan Group are very happy to tackle any issues related to purity as we take our process very seriously. The Kundan group also educates their customers about the various aspects of purity through social media platforms. Ultimately, consumer trust is the most important aspect in silver jewellery and artifacts.

Question- Is there a space for commemoration coins for collectors especially in India?

Yes, there is a good opportunity for commemorative coins as many corporate entities look for silver coins, and after a certain weight being 50 grams it can be a good means of investment. ■■■

Day 2: Session 3- Latest technology updates in Silver industrial applications.

Session moderator: Mr Ketan S Dhruv, Director, Bangalore Refinery Pvt Ltd

Speakers:

Dr Trevor Keel (Director- Material value ltd, UK AND Technical Director- Silver Institute, USA

Mr Andre Christl, CEO, Heraeus Precious Metals

Dr Amol A Kulkarni, CSIR-National Chemical Laboratory

Prof. Parag Bhargava, Particulate Materials (PM) Lab,
Metallurgical Engineering and Materials Science, IIT Bombay

Prof. Subho Dasgupta, Material Engineering, IISc, Bangalore



Mr Ketan S Dhruv

Moderator: In his introductory speech, the moderator shared his experience regarding new technology and stated the importance of research work in various labs. He recalled talks about research on facial recognition and Cad Cam during college, which has become a reality today. Technology plays an important part in any industry, stating, "What's happening in a lab today is going to decide the future."



Dr Trevor Keel

Dr Trevor: The year 2022 saw heavy industrial demand for silver. 556 Moz (1 Moz= 31 tons) of silver demand was generated by industries constituting half of the total silver demand. Besides industrial applications, Silver demand is generated from silverware, silver jewellery, net investment, etc. The demand for industrial applications will increase further due to the demand for green economies.

He discussed the importance of silver in the field of medical science. For wound care & improved antibiotics- Researchers have shown that "boosting" antibiotics with a small amount of silver can lead to the death of between 10 and 1,000 times as many bacteria. The antimicrobial coating is generating a lot of demand for silver. In Japan, scientists have developed cutting-edge technology with the help of silver to detect tuberculosis at a very early stage.

2022 - snapshot

Silver Supply and Demand

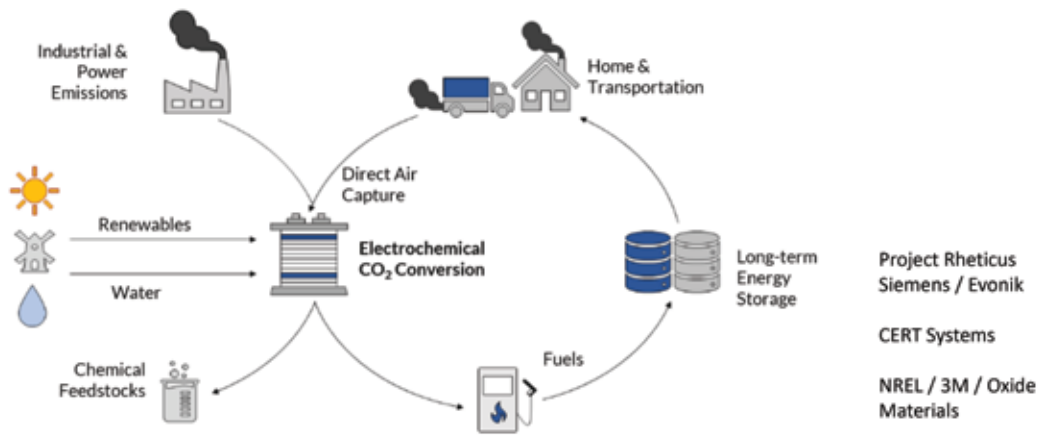
Million ounces	Year on Year											
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023F	2022	2023F
Supply												
Mine Production	882.0	896.8	899.8	863.6	850.3	836.6	782.2	827.6	822.4	842.1	-1%	2%
Recycling	160.4	146.9	145.6	147.0	148.5	148.0	166.0	175.3	180.6	181.1	3%	0%
Net Hedging Supply	10.7	2.2	-	-	-	13.9	8.5	-	-	-	na	na
Net Official Sector Sales	1.2	1.1	1.1	1.0	1.2	1.0	1.2	1.5	1.7	1.7	13%	-1%
Total Supply	1,054.2	1,046.9	1,046.4	1,011.7	1,000.0	999.5	957.9	1,004.5	1,004.7	1,024.9	0%	2%
Demand												
Industrial (total)	440.9	443.4	477.4	515.3	511.2	509.7	488.7	528.2	556.5	576.4	5%	4%
Electrical & Electronics	269.8	272.3	308.9	339.7	331.0	327.3	321.8	351.0	371.5	382.0	6%	3%
...of which photovoltaics	48.4	54.1	93.7	101.8	92.5	97.8	100.0	110.0	140.3	161.3	28%	15%
Brazing Alloys & Solders	53.3	51.0	49.0	50.8	51.9	52.3	47.4	50.4	49.0	49.8	-3%	2%
Other Industrial	117.8	120.1	119.5	124.8	128.3	130.1	119.4	126.8	136.0	144.4	7%	6%
Photography	41.0	38.2	34.7	32.4	31.4	30.7	26.9	27.7	27.5	26.4	-1%	-4%
Jewelry	193.5	202.5	189.1	196.2	203.1	201.4	150.5	181.5	234.1	199.5	29%	-15%
Silverware	53.5	58.3	53.5	59.4	67.1	61.3	31.2	40.7	73.5	55.7	80%	-24%
Net Physical Investment	283.0	309.3	212.9	155.6	165.5	187.0	204.8	274.0	332.9	309.0	22%	-7%
Net Hedging Demand	-	-	12.0	1.1	7.4	-	-	3.5	17.9	-	409%	na
Total Demand	1,011.9	1,061.7	979.7	960.2	985.7	990.0	901.9	1,055.6	1,242.4	1,187.0	18%	-8%

Industrial applications dominate demand

1 Moz = ~31 tons



New catalysts – electrochemical conversion of CO₂



Woundcare & improved antibiotics



Acticoat
Smith & Nephew



Mepilex Ag
Mölnlycke Health Care



Aquacel Ag range
Convatec

- Researchers have shown that “boosting” antibiotics with a small amount of silver can lead to the death of between 10 and 1,000 times as many bacteria
- The increased membrane permeability allows more antibiotics to enter the bacterial cells, which may overwhelm the resistance mechanisms that rely on shuttling the drug back out



Antimicrobial coatings



Antimicrobial Corning® Gorilla® Glass

Product Information

Antimicrobial Coating® Gorilla® Glass is the world's first antimicrobial cover glass with EPA registrations as a treated article. It combines the renowned benefits of Corning® Gorilla® Glass technology, including durability, scratch resistance and toughness. Antimicrobial Coating® Gorilla® Glass is an alkali-aluminosilicate thin sheet glass formulated with an antimicrobial agent to help keep the glass surface clean of stain and odor-causing bacteria.

Applications

- Ideal protective screen cover glass for:
 - Mobile devices, such as smartphones and tablets
 - Laptop computers
 - Medical displays
 - Point-of-sale kiosks
 - Touchscreen monitors and trackpads
- Door, window, and wall surfaces in healthcare settings
- Furniture surface tops where reduced microbe load is

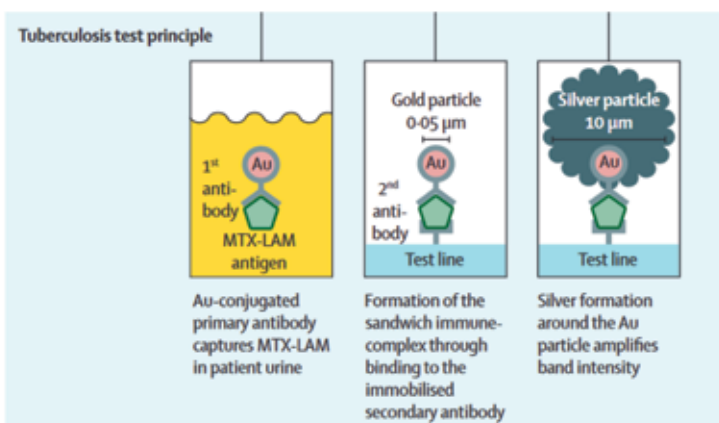


Development of a broad-spectrum silver antimicrobial agent which can kill over 650 different types of microorganisms

Chemically bound to various plastics, and useable in flooring materials, paints, medical devices amongst many other end applications



Cutting edge diagnostics



- A urine based test for TB has been developed by Fujifilm
- Traditional gold-based sandwich assay, amplified by silver
- “Potential to transform the diagnosis of TB”

Water purification



- Commercialisation of the decades of work of Professor T Pradeep, IIT Madras
- Silver-based nanotechnology designed to remove pesticides and arsenic from groundwater supplies
- Thousands of purification units installed in Murshidabad, and many other trials ongoing in India and Nepal
- Tens of millions of people reached



Mr Andre Christl

Mr Andre Christl: Heraeus Precious Metals is a global leader in the field of precious metals. With an employee base of 3000, the company is the market leader in all major precious metals segments. It invests 7% of NPM sales in R&D. It has a total of 12 recycling and production sites across the globe with 4 trading desks across all relevant time zones. They combine all activities related to their comprehensive expertise in the precious metals loop – from trading to precious metals products to recycling. Every year 5000,000,000,000 euros in economic damage is caused by germs. The global market for antimicrobial technologies is projected to continue its growth path in the coming year. Heraeus has launched AGXX – THE innovative antimicrobial technology which finds a wide range of applications like water filtration, polymers, textiles, paints & coatings.

Heraeus Precious Metals

HERAEUS PRECIOUS METALS: LEADING IN PRECIOUS METALS

-  GOLD
-  SILVER
-  PLATINUM
-  PALLADIUM
-  RHODIUM
-  RUTHENIUM
-  IRIIDIUM
-  OSMIUM

We are the world's largest provider of precious metals services and products. We combine all activities related to our comprehensive expertise in the precious metals loop – from trading to precious metals products to recycling.





HERAEUS PRECIOUS METALS: LEADING IN PRECIOUS METALS

Markets served
(selection)

- Chemicals
- Automotive
- Semiconductors
- Luxury

Precious Metals Products

- Chemical Products
- Semi-finished products
- Chemical Catalysts & Gauzes
- Functional Materials
- Emission Catalysts
- Pharmaceutical Ingredients
- Hydrogen Systems
- AGXX



AGXX is a completely new antimicrobial technology

Converting air humidity and oxygen into oxygen radicals

- Non-toxic and environmentally friendly**
 - Catalytically generated reactive oxygen species kill microorganisms
- Long-lasting**
 - Mechanism of action is not based on the release of substances
- Broadband effect**
 - Fast and comprehensive killing of a wide range of microorganisms
- No formation of resistances**
 - Multiple antimicrobial effects prevent development of resistances



AGXX ticks all boxes!!!

	Metal-Ions (Ag, Cu, Zn)	Organic biocides	AGXX
Non-hazardousness / Regulatory-compliance	✗	✗	✓
Long-lasting effect	—	—	✓
Application variety	✓	—	✓
Broadband effect	—	✓	✓
No formation of resistances	—	✓	✓



Dr Amol A Kulkarni

Dr Amol A Kulkarni: This presentation wholly focused on Silver Nanowires with a case study about the different morphologies of Silver, mainly Nano-rods, Nano-particles, and Nano-prisms, followed by a study on the synthesis method. Silver nanowires (AgNWs) combine high electrical conductivity with low light extinction in the visible and are used in a wide range of applications, from transparent electrodes to temperature, mobile screens, and pressure sensors.



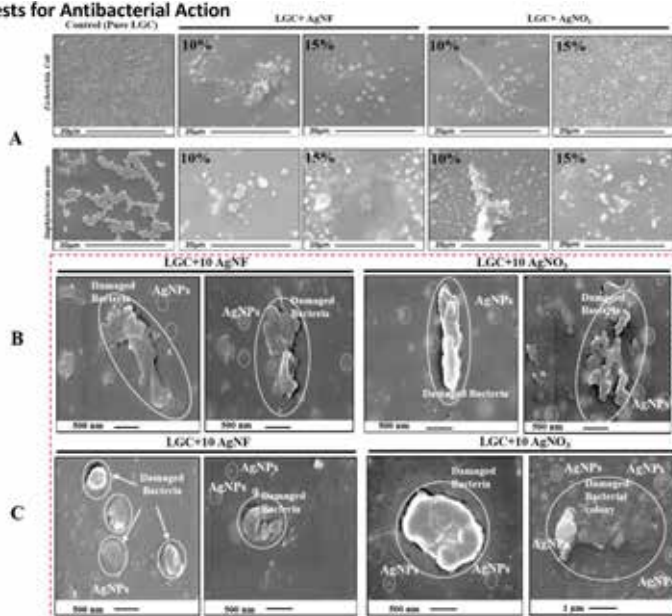
Prof. Parag Bhargava

Prof. Parag Bhargava: He discussed the Silver related work carried out at IIT Bombay. Silver raw materials are produced through wet chemical synthesis at the IIT lab. The key aspects are - Chemical reduction of silver nitrate, Control of shape and size/morphology, Size distribution, and Low degree of agglomeration or ready-to-disperse powders. They also make Silver inks and pastes for printed and electronic applications. Silver conductive ink pens for educational purposes, and Silver ink in tubes for educational, research and conductive glue applications. They have developed an innovative processing route to achieve uniform distribution of silver. Trials have been carried out for conducting adhesive with potential customers. Their low-temperature paste has been regularly sold in small quantities to academic and research organizations. They have developed pastes for screen-printed heaters for a company.

Applications of nano and micron range silver particulates, silver inks and pastes

Parag Bhargava, Professor

Tests for Antibacterial Action

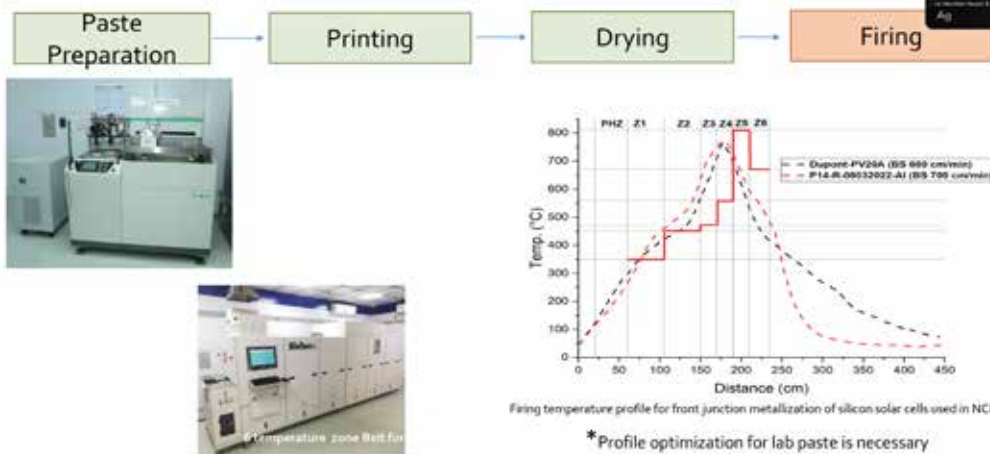


- Varying amount of Silver dispersed in glass / HA
- Also, developing 3D printed ceramic / silver composites

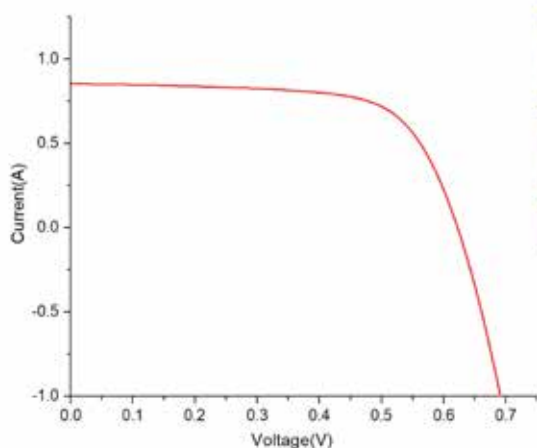


Glass/silver spray coating on Steel substrates for antibacterial character

Silicon solar cell front surface metallization



Electrical characterization of solar cells prepared at IIT Bombay with our own pastes



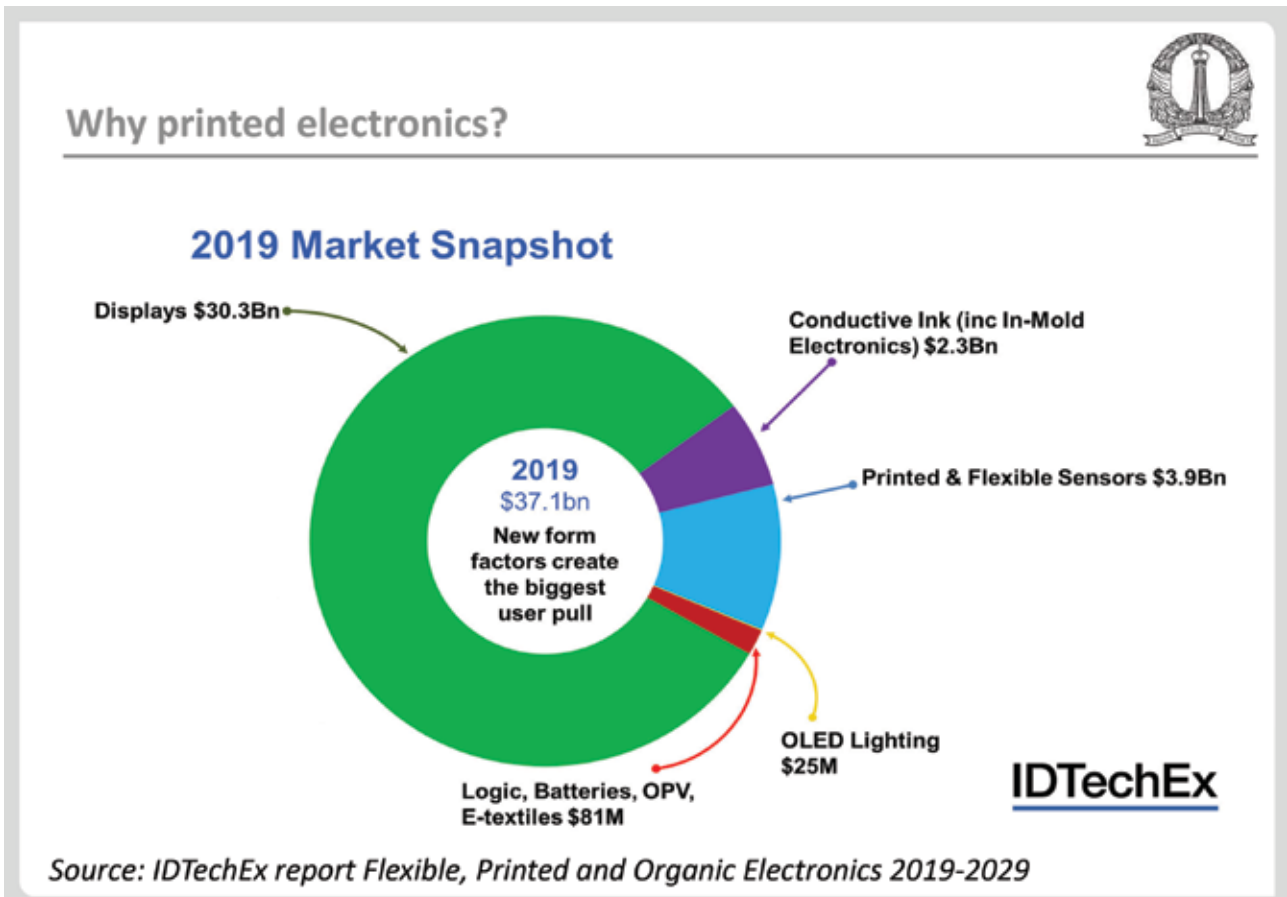
Size:	24.0 cm ²
Isc:	856.78 mA
Jsc:	35.68 mA/cm ²
Voc:	621.283 mV
Impp:	732.40 mA
Vmpp:	491.724 mV
Pmpp:	360.140 mW
Fillfactor:	67.7 %
Eta:	15.0 %





Prof. Subho Dasgupta

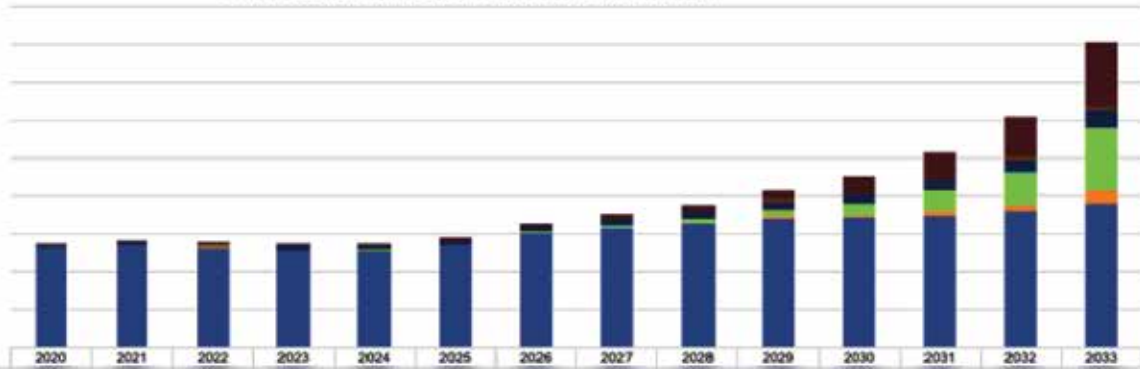
Prof. Subho Dasgupta (IISc, Bangalore): Speech was related to low-temperature curable silver nano ink for PET/paper/glass/textile substrates. Displays, Conductive ink, Sensors, OLED Lighting, and Batteries are a few disruptive industry products dominating the market and requiring silver. The growth rate of these items is multiplying year by year. Silver Ink, as compared to its other substitutes, is Air-stable, has Good anti-oxidation resistance, is Non-toxic and inexpensive, has Very low bulk resistivity~ $1.6 \times 10^{-8} \Omega.m$, and is easily formulated into easy-to-print nano inks with a decent shelf life.





Conductive ink 2020-2033

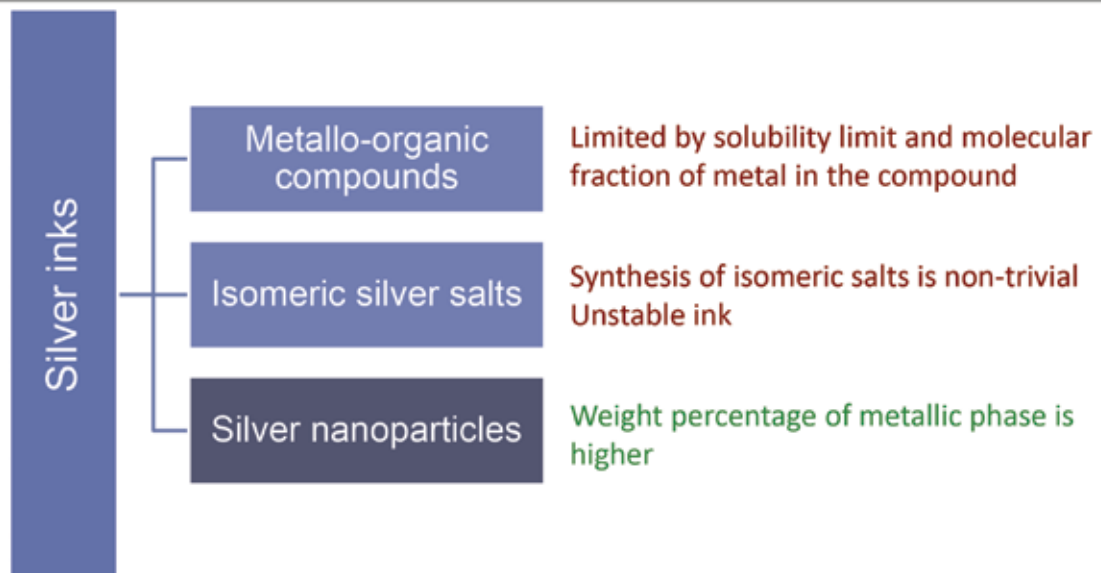
Conductive ink volume for all applications (wet tonnes)



IDTechEx Research

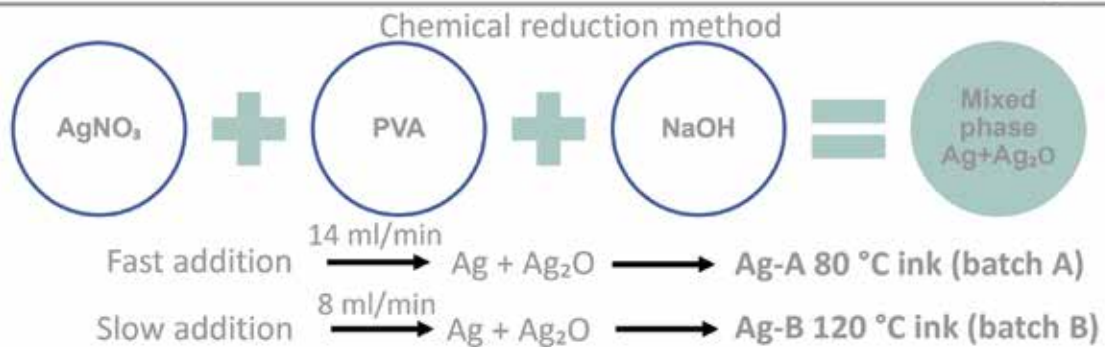


Types of silver inks





Synthesis of silver nanoparticles and nanoink

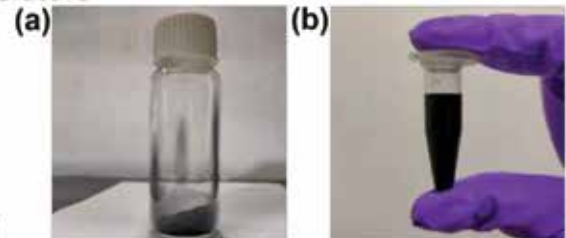


PVA:

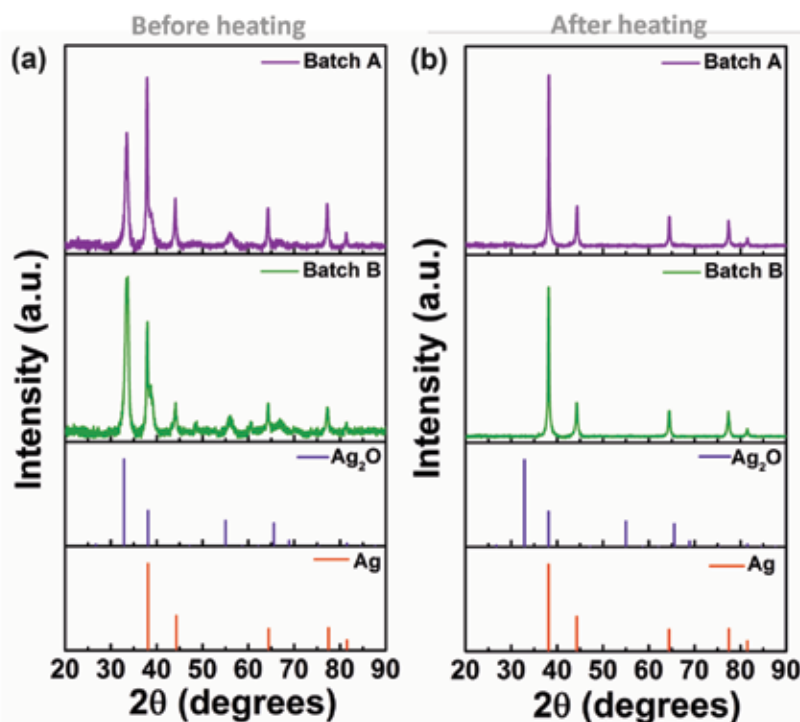
- Dual role of steric stabilizer and reducing agent
- Hydroxyl functional groups reduce silver ions to mixed phase of silver and silver oxide
- Convert silver oxide to silver at very low temperature
- Form a protecting shell

Nanoink:

- Solvent: NMP or DMSO
 - Nanoparticles: 20 wt.%
 - PVA: 5 wt.%
 - Terpeneol: 10 vol.%
- } To improve printability/flowability



XRD of mixed-phase nanoparticles



As-synthesized nanoparticles crystallite size:

- Ag-A \longrightarrow 18 nm
- Ag-B \longrightarrow 9 nm

After heating, crystallite size:

- Ag-A 80 °C \longrightarrow 26 nm
- Ag-B 120 °C \longrightarrow 21 nm

Questions to Dr Amol Kulkarni

You mentioned that a 10-gram silver nanowire would cost about 1lakh rupees. Is this the reduced cost or the final cost? And how many grams of silver is used to make mobile devices?

The figures provided in the presentation are the approximate costs. Silver nanowires can cost up to 60-150\$ if bought in bulk and cost about 100\$ if bought in smaller quantities. The amount of silver used in mobile phones can vary, but it is a very minuscule quantity, usually being 2 milligrams.

Question to Dr Trevor Keel

Has the industry found any alternatives to silver for conductivity?

Considering the properties of silver, there is no need for an alternative. But copper and zinc have been considered as they are conductive to electricity. Scientifically, no other replacement is considered, but commercially, copper and zinc can be used.

Trevor Keel to Mr Amol Kulkarni

Have you gone about patenting your type of silver nanowires, and how do you deal with the

complexities of these nanowires?

Complexities arise only when there is some issue with the synthesis of nanowires. And yes, patenting is being done as this segment has much competition. Silver nanowires are process-oriented, meaning complexities will arise if there is a fault in your process.

Question to Dr Subho Dasgupta

Is there a concern about the toxicity of some substances used in Industrial applications?

If the solvents are used in an appropriate and right manner, then the concern for toxicity does not exist. One should have all the knowledge required before getting into the process.

Moderator to Mr Andre Christl

With the introduction of AGXX technology, do we regularly have to change the filters, and what can be the average age of a filter?

The motive behind this technology is that the filter should not be replaced frequently, which means that these filters are meant to last.



Day 2: Session 4-Topic: Growing Industrial demand for silver in India

Session moderator: Mr Viraj Didwania, Managing Director, Foresight Bullion India Pvt Ltd

Speakers:

Mr Abhishek Jain, Director, Indian Solder & Brazing Alloys Pvt Ltd

Mr Murli Nikam, CEO - Modison Ltd

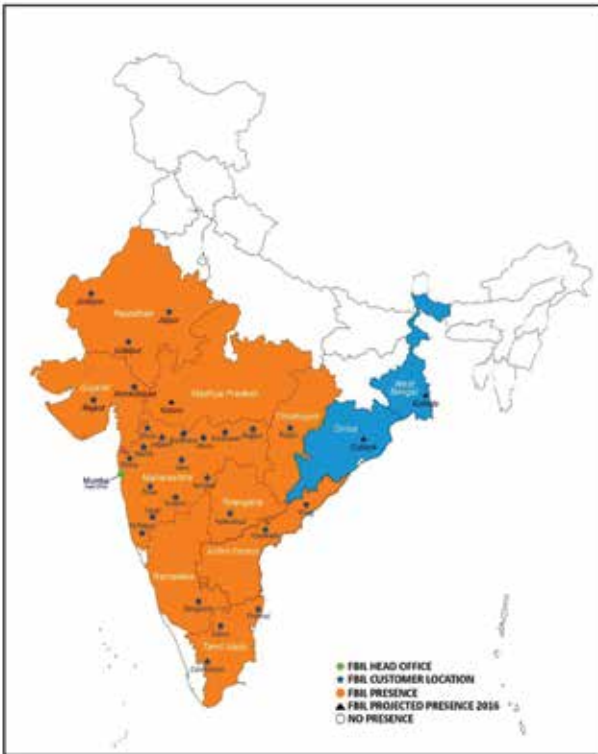


Mr Viraj Didwania: The focus was on the vision and mission of Foresight Bullion and the unique benefits they provide to their customers, which include risk-free delivery to the doorstep, allowing consumers to book in small quantities and many more. The speech detailed the company's products and Foresight Bullion's competitive edge over its competitors.



Mr Viraj Didwania

GROUP PRESENCE IN INDIA



OUR COMPETITIVE EDGE

- FBIL has a stellar reputation in the market for being a professionally run team who are ethical, disciplined and consciously adhere to all rules and regulations of our industry
- FBIL strongly believes in risk mitigation to the extent possible
- In view of this philosophy FBIL hedges each and every transaction on the commodity platform and this hedging ensures that FBIL is not exposed to the volatile movements in the price of silver
- FBIL uses reputed logistics partners like Brinks logistics, G 4 S and Sequel Logistics to transport the silver for International transfers, internal vault transfers or delivery to customer premises
- FBIL also has comprehensive risk management insurance policy which includes most type of risks like Burglary, transit theft, fidelity, premises, personnel carriage etc

UNIQUE BENEFITS TO OUR CUSTOMERS

- Risk free delivery to customer's doorstep
- We offer Unfixed Price delivery to our customers
- We allow customers to book in small quantities at a time

- We are fully transparent and professional with the documentation process from booking to invoicing to delivery.

PRODUCTS

	Silver Bricks	28 – 32 Kgs	Purity 99.90 – 99.99 %
	Silver Cut Pcs	0.8 – 5 Kgs	Purity 99.90 – 99.99 %
	Silver Granules	10 – 20 Kgs	Purity 99.90 – 99.99 %

Mr Murli Nikam: Detailed about the electrical contact manufacturing done by Modison Ltd; pointed out the main challenges faced, including Quality, Delivery, Cost competitiveness, and price volatility. He emphasised the need for good connections between academia and institutes to collaborate and develop innovations within the silver industry. Two suggestions for the industry to build upon were continuous development in manufacturing processes and setting the centre of excellence s for the industry players to overcome their challenges and difficulties.



Mr Murli Nikam



Mr Abhishek Jain

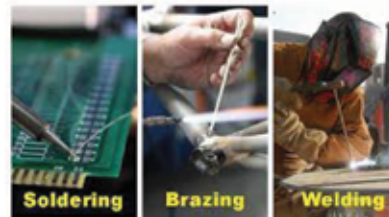
Mr Abhishek Jain: Presented about the brazing industry, including the process of manufacturing Brazing alloys. The speaker distinguished the types of brazing filler metals and the forms and uses of these brazing alloys. The presentation found detailed market sectors, market demand for brazing alloys, opportunities and challenges of the silver brazing industry.

28-30 April 2023 @ Le Meridien Resort & Spa, Jaipur



Welding...Brazing...Soldering...??

- ✓ BRAZING – Coalescence of materials with filler material (liquidus temperature **above** 450°C)
- ✓ SOLDERING – Coalescence of materials with filler material (liquidus temperature **below** 450°C).
- ✓ WELDING – Fusion Joining Process



Types of Brazing Filler Metals

- ✓ Gold Filler Metals
- ✓ Silver Filler Metals
- ✓ Copper Phosphorus Filler Metals
- ✓ Copper Zinc Filler Metals (Brasses and Bronzes)
- ✓ Aluminium Silicon Filler Metals
- ✓ Nickel Filler Metals

Market Segments

- ✓ Infrastructure, appliances and hardware market.
- ✓ HVAC- heating, ventilation, air conditioning systems
- ✓ Refrigeration
- ✓ Automotive Applications
- ✓ Defence
- ✓ Railways
- ✓ Jewellery

Market Sectors

- ✓ Defence
- ✓ Heavy Engineering
- ✓ Railways
- ✓ Power
- ✓ HVAC
- ✓ Automobiles
- ✓ Hydraulic Motors
- ✓ Pumps, Radiators
- ✓ Switchgears
- ✓ Tools

Industry Perspective w.r.t.India

- Silver Brazing Industry – based at Meerut, India.
- Niche market within the Welding Arena.
- MSME units major producers offering low cost solutions matching International standards of quality.
- Low Volumes, High Value.
- MNCs having production in India facilities majorly outsourcing their production. Overseas manufacturers market share is low.
- Price Sensitive market.
- Bulk Buying comes from Government Units.

Silver Demand for Brazing Industry

Brazing Alloys & Solder Demand

Million ounces	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Y/Y
China	24.0	25.0	25.5	24.1	24.5	24.8	25.1	22.5	22.1	19.5	-12%
United States	6.1	6.0	5.7	5.9	6.2	6.4	6.5	6.0	6.5	6.8	3%
Germany	4.9	4.6	4.4	4.3	4.2	4.2	4.1	4.3	4.7	5.0	7%
India	2.4	2.3	2.1	2.2	2.2	2.3	2.2	1.7	2.7	3.0	10%
South Korea	3.0	2.7	2.6	2.3	2.4	2.4	2.3	2.1	2.2	2.3	3%
Japan	2.0	1.9	1.8	1.8	2.0	2.1	2.1	1.9	2.1	2.2	2%
Others	12.5	10.8	8.9	8.6	9.2	9.7	10.0	8.8	9.9	10.3	4%
Global Total	54.8	53.3	51.0	49.0	50.8	51.9	52.3	47.4	50.4	49.0	-3%

Source: Metals Focus

Moderator to Mr Abhishek Jain

With respect to silver brazing alloys, how can India compete with its competitors in the global market?

Post covid India was explored as a prospective producer, unlike earlier. We must also take advantage of our lower labour costs and invest in custom machinery that will help improve our designs and give us a good stance in the global markets.

Moderator to Mr Murli Nikam

As you have been in the manufacturing industry for a long time, can you share your experience with regard to silver?

Yes, my presence in the silver industry has been since 2001, and I have seen much growth, especially in silver, because of its various applications. The silver industry has come a long way, and I look forward to helping this industry in the future.



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Ag 47



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Chairman
National Gem &
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Mr Anus Misra
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