INDIA GOLD CONFERENCE 2025 DAY 1 SEMINAR HIGHLIGHTS

The Second Seminar on “Gold Assaying, Hallmarking and Refining Technologies” at the India Gold Conference 2025 served as a significant platform for professionals across the gold value chain to engage with the latest advancements in quality assurance, testing, and refining technologies. Held on September 11, 2025, at the Pullman Aerocity, New Delhi, the seminar brought together technocrats, refiners, policymakers, and quality control experts to explore evolving standards and processes shaping India’s leadership in the global gold ecosystem. The morning began with registration and networking followed by a welcome address, setting the stage for an intensive workshop on XRF Spectroscopy led by Dr. Mike Hinds, Good Delivery Consultant, LBMA. This session provided participants with practical insights into advanced analytical techniques crucial for accurate elemental analysis and certification in gold assaying.

Post-lunch, the seminar delved into specialized technical sessions covering crucial industry topics. Eminent speakers including Mr Pankaj Deshmukh (MMTC-PAMP), Ms Makhosazana Sikhakhane (Rand Refinery), Mr Dinesh Singh (CSIR-NPL), and Mr Chandan Rao (BIS) discussed global benchmarks in laboratory accreditation, cupellation losses, certified reference materials, and hallmarking regulations. The final sessions, led by Mr Ankur Srivastava (MMTC-PAMP), Mr Ajay Raina (Fischer), and Mr Stefano Zoi (Italimpianti Orafi), highlighted challenges in refining and showcased technological innovations in machinery and instrumentation. Through expert-led presentations, knowledge exchange, and networking opportunities, the seminar underscored India’s ongoing commitment to enhancing precision, transparency, and reliability in gold refining and hallmarking practices.

Technical Session-1 Workshop on XRF Spectroscopy

Dr. Mike Hinds – Workshop on XRF Spectroscopy

Dr. Mike Hinds delivered a comprehensive workshop on the role of X-ray Fluorescence (XRF) Spectrometry in precious metal analysis, emphasizing its importance for non-destructive testing of gold, silver, and platinum. Using primary X-rays to excite atoms at the surface and detect characteristic secondary X-rays, XRF enables accurate elemental identification and quantification. Key methodologies included Energy Dispersive (EDXRF) and Wavelength Dispersive (WDXRF) systems. He stressed on the importance of developing standards, meticulous sample preparation, correcting matrix effects, and use of certified reference materials to ensure precise results.

Key Points:

- XRF is a non-destructive method and hence preserves sample integrity. However, it is a surface measurement technique. Hence homogeneity of the sample, and preparation of surface are critical.
- Importance of correcting matrix effects (absorption, enhancement).
- Certified reference materials enhance accuracy and traceability.
- Systems covered: EDXRF and WDXRF, each with distinct applications.
- Lab quality control practices improve reproducibility.
- Application in detecting purity, plating thickness, and authenticating jewellery.
- Advances in detectors (Silicon Drift Detectors) extend elemental analysis range.

Technical Session-2: Assaying and Quality Control

Mr Pankaj Deshmukh – ISO/IEC 17025 Accreditation Readiness

Mr Pankaj Deshmukh discussed the critical steps for precious metal laboratories to attain ISO/IEC 17025:2017 accreditation, underscoring the standard's comprehensive coverage of technical and management system requirements. He emphasized that accreditation is not merely a compliance exercise but a robust framework to ensure the highest levels of accuracy, reliability, and global recognition of test results. Drawing from MMTC-PAMP's journey, he illustrated how meticulous documentation, proper resource allocation, and skilled personnel form the backbone of a successful accreditation process. Mr Pankaj also stressed the importance of building a culture of quality within laboratories, where continuous improvement becomes a core operational principle.

Key Points:

- Accreditation ensures laboratory competence and reliability.
- Documentation is critical: Quality manuals, SOPs, and recordkeeping.
- Focus on personnel skill development and continuous training.
- Calibration and verification of equipment critical.
- Internal audits and management reviews foster improvement.
- Preparation for external assessments requires transparency and readiness.
- Represents an ongoing commitment to quality assurance.

Technical Session-2
Factors affecting cupellation loss of gold and silver beads from low grade material

Ms Makhosazana Sikhakhane –
Factors Affecting Cupellation Loss

Ms Sikhakhane analyzed variables affecting gold and silver loss during the cupellation process, essential for refining precious metals in low-grade materials. Her research focused on process variables such as temperature, cupel selection, airflow, timing, alloy composition, and analysis technique, highlighting that silver is more susceptible to loss than gold due to higher oxidation and volatilization.

Key Points:

- Cupellation removes base metals, leaving noble metal beads.
- Loss mechanisms include absorption and volatilization.
- Silver more prone to losses than gold.
- Controlled experiments established recovery factors (~99.6% gold, ~96.3% silver).
- Accurate correction factors aid inventory and payment accuracy.
- Highlights need for precise methodology and quality control.

Technical Session-2 Quality Assurance in Gold Testing Through BNDs (Bharatiya Nirdeshak Dravya)

Mr Dinesh Singh – Quality Assurance Using BNDs

Mr Dinesh Singh presented on the application of Bharatiya Nirdeshak Dravya (BND) Certified Reference Materials (CRMs) developed by India's National Measurement Institute to enhance the accuracy and reliability of gold assay testing. He explained how BNDs serve as a vital benchmark for metrological traceability, ensuring that assay results are consistent, reproducible, and aligned with global standards. Drawing attention to India's capability in producing world-class CRMs, Mr Singh outlined the meticulous process of material selection, preparation, and certification that ensures their reliability. He also stressed how BNDs strengthen consumer confidence, support regulatory compliance, and provide a competitive edge for India's gold industry in the international market.

Key Points:

- Indigenous BND CRMs ensure measurement precision and traceability.
- Comprehensive material selection and certification processes.
- Supports assay accuracy and reduces inter-lab variability.
- Critical for maintaining consumer trust and regulatory compliance.
- Emphasizes maintaining proper ratios and conditions in assay protocols.
- Enhances valuation and standardization in the gold ecosystem.

Technical Session-2 Hallmarking of Gold Jewellery in India - Regulatory Perspective

Mr K. Chandan Rao – Regulatory Perspective on Hallmarking

Mr Chandan Rao outlined India's BIS Hallmarking scheme evolution, regulatory details, and ongoing digitization efforts. The scheme mandates hallmarking for various gold and silver articles, ensuring consumer protection by enforcing strict purity standards without tolerance for negative deviations. Expansion milestones, exemptions, and new features like Hallmark Unique Identification (HUID) and mobile-based verification were highlighted.

Key Points:

- Hallmarking evolved from voluntary to mandatory, covering most districts.
- Covers gold and silver, with certified designs, and grave exemptions.
- BIS certification processes include audits, surveillance, and market testing.
- Digital integration: HUID, mobile app verifications, and automated XRFS.
- Reflects commitment to transparency and consumer confidence.
- Detailed listing of licensed refiners showcases wide national coverage.

Technical Session-3: Gold Refining Challenges in gold and silver refining

Mr Ankur Srivastava – Challenges in Gold and Silver Refining

Mr Ankur Srivastava explored refining methodologies and the associated technical, environmental, and safety challenges faced by modern refineries. He emphasized the critical importance of controlling chemical, physical, and procedural variables to achieve the highest purity levels in gold and silver production. His presentation outlined the evolving regulatory environment and how refiners must balance productivity with environmental stewardship. Drawing from MMTC-PAMP's operational experience, Mr Srivastava illustrated best practices for emission control, process optimization, and waste minimization. He also highlighted industry trends toward automation and sustainable refining methods that align with international benchmarks and ensure compliance with green manufacturing standards.

Key Points:

- Discussed pyrometallurgical, chemical, and electrolytic refining techniques.
- Highlighted process control challenges: sampling, impurity removal, and electrolyte management.
- Flooded with complex impurity profiles including PGMs and base metals.
- Environmental aspects include emissions control, wastewater treatment, and stringent regulations.
- Stressed high safety standards: PPE, ventilation, and emergency protocols.
- Promoted Acid-less Separation technology to reduce chemical use and pollution.

Technical Session-4: Update from Machinery Suppliers

Mr Ajay Raina – Advances in XRF for Jewellery Analysis

Mr Ajay Raina provided a detailed account of advances in XRF technology tailored for jewellery analysis, emphasizing its superiority over traditional methods due to its non-destructive nature and quick result turnaround. Developments in detector technology (especially Silicon Drift Detectors) and software have enhanced the reliability and scope of analysis. He highlighted how XRF has become an indispensable tool for both manufacturing and retail segments, ensuring accuracy in gold purity verification. The presentation also showcased real-world applications from leading assay laboratories and manufacturing units in India. Moreover, Mr Ajay underlined the importance of calibration standards and operator training to achieve consistent and reproducible results.

Key Points:

- Modern XRF replaces traditional destructive testing methods effectively.
- Features improved detectors, software automation, and digital integration.
- Capable of analyzing complex alloys and coatings on jewellery.
- Supports regulatory compliance, fraud prevention, and consumer confidence.
- Environmental benefits by eliminating chemical waste.
- Future trends include AI and cloud-based data analysis.

Technical Session-4: Update from Machinery Suppliers

Mr Stefano Zoi – AI-Driven Automation in Refining

Mr Zoi introduced the Artificial Intelligence Detection (A.I.D) system for automated control of acid dosage and reaction monitoring in aqua regia-based refining. This intelligent system employs sensors, pneumatic controls, and image analysis to optimize the refining process, reduce reagent usage, emissions, and enhance safety. He explained how the A.I.D system brings precision and repeatability to refining operations that traditionally depend on manual judgment. The presentation included case studies from Italimpianti Orafi installations worldwide, demonstrating measurable improvements in process efficiency and environmental sustainability. Mr Zoi also discussed how integration with digital dashboards and data analytics allows operators to monitor and adjust processes remotely with high accuracy.

Key Points:

- A.I.D system automates acid dosing based on real-time reaction assessment.
- Integrates pneumatic valves, sensors, and endoscopic cameras with AI.
- Results in reduced chemical usage and lower environmental footprint.
- Improves operational efficiency and consistency.
- Enhances workplace safety by early detection of abnormalities.
- Represents a leap toward Industry 4.0 standards in refining.

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