

THE SCIENCE OF MAKING...

VOLUME 2

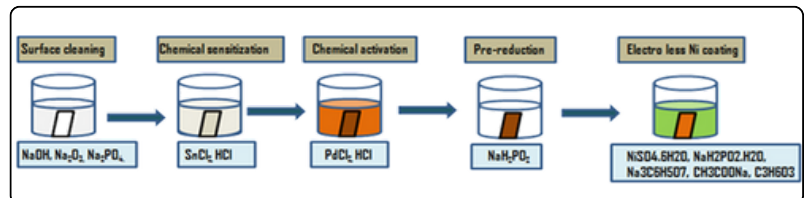
ISSUE 1

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TECHNICAL ACHIEVEMENTS

➤ ELECTROLESS PLATING SYSTEM FOR NICKEL THIN FILM

The Sensor Technology Development Centre at CMTI has successfully developed and optimised a compact, in-house electroless plating setup for Nickel (Ni) thin-film deposition. This initiative was driven by the need for a versatile and cost-effective plating capability essential for advanced sectors such as electronics, telecommunications, and aerospace and automotive.



PROCESS OF THE ELECTROLESS PLATING OF NICKEL THIN FILMS

Unlike traditional electroplating, which requires an external electrical supply and a conductive substrate, electroless plating is a purely chemical process. This enables uniform metal deposition on substrates that are typically difficult to plate, including silicon/SiO₂ wafers, ceramics, and glass, and supports complex three-dimensional geometries. The simplicity of the system, combined with the absence of external power requirements, significantly reduces setup costs and process complexity. A key achievement of the project was the complete in-house formulation and optimisation of the plating solution. The process involved preparing chemical solutions from metal salts, reducing agents, complexing agents, and acids, followed by fine-tuning critical process parameters such as pH, temperature, and chemical composition to achieve uniform, high-quality coatings. Additionally, a robust multi-step surface preparation protocol was developed, incorporating controlled surface roughening, chemical sensitisation, and activation to enhance coating adhesion. The developed Ni plating system consistently produced adherent coatings with a deposition rate of 7–10 μm/h and a surface roughness of approximately 0.05 μm, demonstrating strong process reliability and performance. This successful implementation represents a significant step toward strengthening indigenous capabilities in functional metallic thin-film technologies.

➤ VM-10T VERTICAL PLANETARY MIXER DEVELOPED BY CMTI SUCCESSFULLY VALIDATED AT ISRO"

The Vertical Planetary Mixer VM-10T supplied to ISRO-SHAR was successfully tested with live ingredients, demonstrating excellent performance during the live mixing process. The ISRO team congratulated CMTI on achieving this significant milestone. The development of the largest capacity VM-10T stands as a testament to CMTI's R&D efforts, featuring in-house design, engineering, and validation, delivering a cost-effective, high-precision machine and processing solution tailored to specialised industry needs.

RESEARCH PAPER PRESENTATION/CONTRIBUTORY TALKS

PRESENTATION AT THE NATIONAL CONFERENCE ON CONDITION MONITORING (NCCM) 2025

Mr Mayank Patel, Scientist-B, C-SMPM, participated in the National Conference on Condition Monitoring (NCCM) 2025. He presented a research paper titled “Real-time In-situ MIG Welding Process Monitoring Using LDR Sensor: A Case Study” at the conference held on 27–28 November 2025. The event was organised by GTRE (DRDO) and CMSI, and hosted at the HAL Management Academy, Bengaluru.



MOUS/NDAS

- ★ CMTI Bengaluru and the Indian Institute of Information Technology, Design and Manufacturing (IIITDM), Kurnool, signed a MoU to strengthen collaboration in advanced manufacturing and Industry 4.0 technologies. The MoU enables joint research and development, academic collaboration, and skill development in areas such as additive manufacturing, smart manufacturing, micromachining, automation, IoT, metrology, sensor systems, materials science, and surface engineering. Both institutions will share research infrastructure and jointly pursue national and international research funding. The partnership also focuses on capacity building and industry-oriented education, including co-branded academic programs, PhD and MS opportunities for CMTI scientists, and industry-relevant projects for IIITDM Kurnool students. The collaboration is expected to enhance research capability and contribute to the development of a skilled, job-ready workforce for the manufacturing sector.
- ★ CMTI and M/s. Laser & Turbo Limited (L&T), Bengaluru, have entered into an NDA for the “Supply of tubes on requirement of disclosure of engineering data, drawings and documents for the supply of GHR internals for the Mongol Project and associate equipment”.
- ★ CMTI and M/s. Spawn 3D Private Limited, Bengaluru, have signed an NDA for the “Evaluation of a potential collaboration in advance manufacturing, 3D Printing technologies, Product Development, Prototyping and related technical discussion (limited to Food 3D Printing and the Manufacturing of Food 3D Printers).”



EVENTS/CELEBRATIONS

KANNADA RAJYOTSAVA CELEBRATION AT CMTI 2025

CMTI celebrated the 70th Karnataka Rajyotsava (the 40th Rajyotsava celebration at CMTI) on 28 November 2025 with great enthusiasm and cultural fervour. The day began with the raising of the Karnataka flag by the Honourable Director of CMTI, in the presence of all CMTI members, followed by a melodious Nada Gethe. The event was graced by Shri L N Mukund Raj, President of Kannada Sahitya Parishat, and Shri Darmendra Kumar Arenahalli, a renowned Kannada writer, as Chief Guests. The Director of CMTI presided over the function, which was inaugurated with the ceremonial lighting of the lamp by the dignitaries. As part of the celebrations, various cultural and sports competitions were organized, and the Chief Guests distributed prizes to the winning participants. The institute arranged a traditional Karnataka lunch for all employees and their families who attended the event. The celebration also featured captivating cultural performances by CMTI employees, including dances, skits, and singing. Children of employees added charm to the event with their mesmerizing dance performances, making the day memorable for everyone.





NATIONAL LIBRARY WEEK CELEBRATION AT CMTI

CMTI observed National Library Week from 14 to 20 November 2025, in line with the national initiative to emphasize the importance of libraries and promote reading habits among people. The week-long observance aimed to encourage effective use of library resources and highlight the role of libraries as centres of knowledge, creativity, and information. National Library Week was initiated by the Indian Library Association (ILA) in 1968, inspired by the vision of Dr. S. R. Ranganathan, who envisioned libraries as dynamic hubs of learning accessible to all.

As part of the celebrations, the CMTI Library organized theme-based book displays throughout the week:

- 14 November 2025: Display of books related to Nanotechnology
- 17 November 2025: Display of books on MEMS Sensors and Robotics
- 18 November 2025: Display focusing on MEMS Sensors and Nanotechnology
- 20 November 2025: Display of books on Design, Manufacturing Science, and Technology

Additionally, a technical and non-technical article-writing competition was held to promote knowledge sharing and creative expression. A total of 50 articles were received across categories, including Computer Science, Electrical and Electronics Engineering, Materials Science and Metallurgy, Mechanical Engineering, and Non-Technical topics. The shortlisted finalists were awarded cash prizes and certificates in recognition of their contributions and participation. The observance witnessed enthusiastic participation from CMTI employees and reinforced the importance of libraries in lifelong learning and professional development.





EVENTS/ WORKSHOPS ATTENDED

PARTICIPATION IN NABL “GUNVATTA PATHSHALA” TRAINING PROGRAM



Mr. Abhishek Suchak, Scientist-C, participated in the two-day training program titled “Gunvatta Pathshala” organized by the National Accreditation Board for Testing & Calibration Laboratories (NABL) on 17–18 November 2025. The program was held in Vadodara, Gujarat, and was designed for quality managers of NABL-accredited laboratories to enhance their understanding of quality standards and associated procedures.

The sessions were conducted by esteemed trainers Mr Neeraj Verma (Deputy Director, NABL) and Mr. Asish Kakran (Assistant Director, NABL).

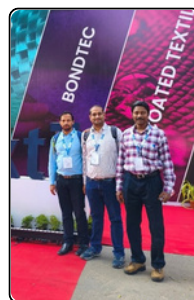
PARTICIPATION IN THE 33RD CII EXCELLENCE SUMMIT 2025

Mr. Krishna Rathod (Scientist-F), Mr. Anantha Padmanabha K.M. (Scientist-F), Mr. Tom Thampy (Scientist-E), Mr. Raju V.R. (Scientist-E), and Mr. Gopi Krishna S. (Scientist-D) attended the 33rd CII Excellence Summit 2025 held at Taj Airport, Bengaluru, on 18–19 November 2025.



PARTICIPATION IN TECHTEXTIL INDIA 2025

A CMTI team comprising Shri B.R. Mohanraj (Jt. Director), Shri Pavan N. (Scientist-D), and Shri Saravanan K. (Scientist-D) visited Techtextil India 2025, held from 19–21 November 2025 at the Bombay Exhibition Centre, Mumbai. Organised by the Messe Frankfurt network, Techtextil India is a premier B2B exhibition focused on technical textiles, non-wovens, and composites. The event showcased innovations across 12 major application areas and featured daily conferences on themes such as Smart Solutions for Key Segments of Technical Textiles (powered by ITTA), sports textiles (in collaboration with Concepts N Strategies), and technical textiles (in partnership with SPE India).

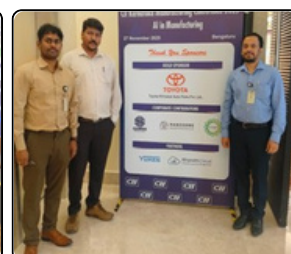


PARTICIPATION IN FUJIFILM TECHNICAL WEBINAR

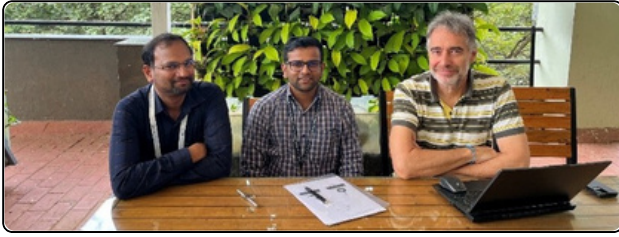
Shri Yogesh Patil (Scientist-B) participated in an online webinar hosted by FUJIFILM Corporation, Tokyo, on 19 November 2025. The session provided an in-depth overview of recent advancements in pressure analysis, covering specifications and usage guidelines for FUJIFILM Prescale films, effective methods and real-world examples for measuring pressure during thermal pressing processes, and techniques for accurate pressure quantification using the FUJIFILM Prescale Mobile solution.

PARTICIPATION IN CII KARNATAKA MANUFACTURING CONFERENCE 2025

Mr Bharat P. (Scientist-D), Mr Suresh Setti (Scientist-B), and Mr Bishnu Prasad Sahu (In Charge – BD) attended the CII Karnataka Manufacturing Conference 2025 held at Hotel Royal Orchid, Bengaluru, on 27 November 2025.



PARTICIPATION IN NANOSCIENTIFIC SYMPOSIUM INDIA



Shri Yogesh Patil (Scientist-B) attended the NANOScientific Symposium India at the IISc, Bengaluru, on 15 October 2025. The symposium offered valuable discussions on non-contact measuring systems and brought together eminent participants, including Dr Yves Emery, CEO of Lyncee Tec Pvt. Ltd., Switzerland, and Shri Vedha Muthu, Director of Podhikai Scientific Solutions.

HINDI EXAMINATION CONDUCTED AT CMTI

The Ministry of Home Affairs, Department of Official Language (Government of India), conducts Hindi examinations twice a year under the Hindi Teaching Scheme. The scheme includes four levels of examinations: (i) Prabodh, (ii) Praveen, (iii) Pragya, and (iv) Parangat. CMTI has been recognized as an examination centre under this scheme. Accordingly, the Parangat examination was conducted at CMTI on Saturday, 22 November 2025, with approximately 180 government officials. employees who appeared for the exam. The examination was held in two sessions, one in the morning and one in the evening, for Paper I and Paper II, respectively. All officials appreciated CMTI's efforts and the smooth facilitation of the examination.



TRAINING INITIATIVES

TRAINING PROGRAMME ON "NOISE AND VIBRATION ANALYSIS METHODS (BASIC AND ADVANCED)"



A comprehensive training programme on "Noise & Vibration Analysis Methods (Basic and Advanced)" was conducted from 17 to 20 November 2025, with participation from professionals representing various organizations. The programme was coordinated by Mr. Girish Kumar M, Scientist-E (C-SMPM). The curriculum included fundamental concepts of mechanical systems, instrumentation techniques, and advanced topics such as noise and vibration analysis and dynamic balancing, supplemented by practical demonstrations to enhance participants' understanding.

TRAINING PROGRAMME ON CO-ORDINATE METROLOGY (CMM)

A training programme on "Coordinate Metrology (CMM)" was conducted at CMTI from 19 to 21 November 2025, coordinated by Mr Siddaraju K G, TA-I. The programme covered fundamental principles of coordinate metrology, including an introduction to CMM architecture, probing systems, and measurement strategies. Participants received detailed exposure to the elements and operational aspects of CMMs, along with demonstrations conducted in CMTI metrology laboratories. The training also included introductory sessions on Geometric Dimensioning and Tolerancing and alignment methods, followed by practical demonstrations on workpiece



alignment strategies for accurate dimensional measurement. Additionally, participants were introduced to laser tracker systems, with live demonstrations highlighting their application in GD&T inspection and large-volume measurement. The programme concluded with an interactive session summarizing key learnings and addressing participant queries.

➤ **EXCLUSIVE TRAINING PROGRAMME ON "SMART MANUFACTURING SYSTEMS & INDUSTRY 4.0/5.0" FOR HAL BENGALURU**

A three-day training programme on "Smart Manufacturing Systems and Industry 4.0/5.0" was conducted from November 19–21, 2025, for HAL Bengaluru, and was coordinated by Mr Narendra Reddy (Scientist-D, C-SMPM). The programme featured comprehensive lectures and demonstrations covering key topics such as an introduction to smart manufacturing and Industry 4.0, digitisation of legacy machines, machine-to-machine connectivity, smart sensors and controls, reverse engineering, conventional manufacturing techniques, and smart metrology. Additional sessions included IIoT demonstrations, machine vision and its applications,

data acquisition for industrial IoT, edge devices, digital twins, augmented reality applications, and smart factory implementation. The training also covered AI/ML in manufacturing, the role of hydraulics and pneumatics in smart manufacturing, and live demonstrations of use cases, including PLC automation, basic programming, and collaborative robotics. Participants also visited various CMTI labs to witness real-time implementations.



➤ **TRAINING PROGRAMME ON "LABORATORY MANAGEMENT & INTERNAL AUDIT AS PER ISO/IEC 17025:2017"**



A training programme on "Laboratory Management & Internal Audit as per ISO/IEC 17025:2017" was conducted at CMTI from 24- 27 November 2025 for participants from various organizations. Coordinated by Mrs. Khushboo, Scientist-D, the programme covered comprehensive topics essential for laboratory accreditation and internal auditing. It commenced with an introduction to laboratory accreditation and the ISO/IEC 17025:2017 standard, followed by in-depth sessions on general and structural requirements, including impartiality, confidentiality, and resource management.

Subsequent sessions focused on process requirements such as method validation, sampling, and measurement uncertainty, enriched with hands-on exercises. The final day highlighted internal audit practices, audit findings, corrective actions, and the pathway to NABL accreditation. The sessions were facilitated by faculty members Mr. K. Niranjana Reddy, Mr. Vijet Bhandiwad, Mr. Chetan H. S., Mr. Shashikumar, Mr. Krishna Mohan B, along with guest faculty Mr. Avadhani S. S., and concluded with an evaluation test and an interactive Q&A session.

➤ **TRAINING PROGRAMME ON "SEMICONDUCTOR DESIGN AND FABRICATION PROCESSES"**

A comprehensive training programme on "Semiconductor Design and Fabrication Processes" was successfully conducted at CMTI from 24 to 25 November 2025. The programme was coordinated by Mrs. Kusuma N, Scientist-E and Mrs. Megha Agarwal, Scientist-D. The training covered an introduction to MEMS and semiconductor fabrication, including transduction principles, MEMS design methodologies, and thin-film deposition techniques. Detailed sessions were conducted on polymer-based microfabrication, photolithography, and dry and wet etching processes commonly employed in device fabrication. In addition, participants were introduced to characterization and metrology techniques essential for evaluating micro- and nano-fabricated devices. The programme was complemented by a laboratory visit, providing hands-on exposure to semiconductor fabrication facilities and reinforcing practical understanding of the concepts discussed.





TRAINING PROGRAMME ON "SEMICONDUCTOR PACKAGING AND CHARACTERIZATION PROCESSES"



A comprehensive training program on Semiconductor Packaging and Characterisation Processes was successfully conducted at CMTI from 26 to 28 November 2025. The program was coordinated by Mr Harsha S, Scientist-D and Mrs Megha Agarwal, Scientist-D. The training covered a wide range of topics, including an introduction to MEMS and semiconductor packaging, thermal management and packaging materials, package sealing, packaging inspection and hermeticity testing, wafer dicing, wafer bonding, wire bonding and bond testing, and electronics signal conditioning. Participants were also introduced to advanced characterisation techniques, encompassing optical, electrical, and mechanical methods.

The program featured a flip-chip bonding demonstration, a laboratory visit, and an interactive feedback and concluding session, providing participants with valuable hands-on exposure and practical insights.

UPCOMING TRAINING PROGRAMMES

1. "Design for Manufacturing & Assembly", Course Code: 1102, from 11 – 12 December 2025, at CMTI Bengaluru.
2. "Advance Engineering Materials Testing & Characterisation", Course Code: 1308, from 15 – 17 December 2025, at CMTI Bengaluru.
3. "Materials & Metallurgy and Heat treatment of metals and alloys", Course Code: 1307, from 07 – 09 January 2026, at CMTI, Bengaluru
4. "Gear Engineering", Course Code: 1101, from 19 – 20 January 2026, at CMTI, Bengaluru.



Editorial Team 

Dr. Debeshi Dutta - 8670958202
Dr. Anusha Epparla - 7382413886
Ms. Pallavi M
write to us: directoroffice@cmti.res.in



Central Manufacturing Technology Institute
Tumkur Road, Bengaluru - 560022,
Karnataka, India Tel: +91-80-23372048
E-mail : director@cmti.res.in
Website : www.cmti.res.in