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E-mail: secretarygeneral.iim@gmail.com

iimmetalnews@yahoo.com

Phone: 033-2367 9768 / 2367 5004

Website: www.iim-india.net

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Presidential Speech

@ IIM-ATM 2023



Ladies and Gentlemen, esteemed members, and distinguished guests, a warm welcome to this special occasion IIM Awards ceremony, an event that recognizes and celebrates the outstanding contributions of individuals and organizations to the Indian metal industry. I am delighted to be here today, representing the Indian Institute of Metals as we honor these pioneers.

As we celebrate the achievements of the awardees, it is essential to reflect on the present status of the Indian Institute of Metals and chart a course for our future. The IIM stands today as a proud institution, with a rich heritage of over 75 years of service to the Indian metal industry. From a humble beginning we currently boast a membership of over 10,000 individuals from different fields related to metallurgical industries. We have played a pivotal role in fostering innovation, promoting collaboration, and shaping the industry's future direction.

However, as we face an increasingly competitive and dynamic global landscape, we must not rest on our laurels - we must continue to evolve and adapt to the ever-changing demands of the industry and the world around us.

We believe that a diverse and engaged membership will be the driving force behind our future success. To achieve this, we will implement targeted membership drives, enhance engagement initiatives, and develop tailored programs for young professionals.

The heart of our institute lies in innovation, and to propel this, one of our key priorities is to create a talent pool and innovation ecosystem that will support the development of new alloys for new products and applications in emerging areas.

We will achieve this by fostering closer collaboration between industry, academia, and research institutions. We will also establish innovation hubs and incubators to nurture and support promising start-ups in the metal sector. Through these initiatives, we aim to cultivate a vibrant ecosystem that attracts, nurtures, and empowers the next generation of metallurgists and innovators. We will push the boundaries of metallurgical science and contribute to technological advancements that shape the future.

The IIM recognizes the urgent need for the metal industry to transition towards a more sustainable future. This key challenge of our time demands collective action. We will create a platform at the industry level to work on decarbonization, green energy, and circularity. This platform will serve as a crucible and will bring together experts, policymakers, and industry leaders. And will develop and implement strategies to promote sustainable practices in metal industry and contribute to the global effort to mitigate climate change

Our institute, the IIM, thrives on your participation and contributions. I would like to extend my appeal to all our members to take up the mantle of leadership in our membership drive and engage in our training & talent development programs. We urge you to become active members, contribute to our technical committees, and share your expertise to advance the field of metallurgy. Your involvement is pivotal in shaping the future trajectory of the Indian Institute of Metals.

The global stage beckons, and as a strategic imperative we aim to strengthen our relationships with international metal institutes, such as IIIM, GDMB, IOM3, and AusIIM. Additionally, we plan to develop special network programs with institutes in regional SAARC countries and across Asia. These partnerships will broaden our horizons, provide us with access to global best practices, facilitate research collaborations, reach to a wider audience and elevate the standing of the Indian Institute of Metals on the global platform.

Finally, as we applaud the accomplishments of our awardees today, I would also like to thank our fellow members for your commitment, dedication, and passion for metallurgy. The path ahead is paved with opportunities for growth, innovation, and collaboration. Together, we can ensure that the Indian metal industry remains a global leader in innovation, sustainability, and excellence.

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**GD Birla
Gold Medal Lecture****Niobium Alloy System: An underutilized Saga****Raghvendra Tewari**

Materials Group, Bhabha Atomic Research Centre, Mumbai 400085

In my research career of 34 years, I have worked on many alloys and materials. Fascinating field of materials characterization and microscopy has always attracted me to develop new materials, find out underlying mechanisms and provide solutions to unresolvable problems. Among various material, niobium-based alloys because of their unique properties have drawn my attention. Today I devote my presentation to this wonderful but underutilized and one of the least studied alloy systems. In addition, this will be my tribute to my guide Late Dr. Srikumar Banerjee, as this idea of starting research work on Nb based alloys has given necessary driving force for the work.

Among the five elements, which are commonly referred as refractory metals, Nb metal stands out because of its applicability in widest temperature range spanning from 4K as superconductor to 1400 K as structural material. By virtue of these peculiar properties Nb has always been a part of materials development program of Department of Atomic Energy (DAE). The present talk is mainly devoted to the development of niobium and its alloys for various applications. However, to provide a wider prospective, other refractory metals have also been included.

Refractory metals (V, Nb, Ta, W, Re) and their alloys are capable of meeting an aggressive environment with respect to radiation, temperature, corrosion (gaseous and liquid metal) and stress for prolonged periods. These materials can therefore cater to high temperature structural materials for new generation nuclear reactors like accelerator driven systems, compact high temperature reactors (CHTR), advanced heavy water reactor fusion devices and space shuttles, aerospace structures, jet engine materials and furnace heating and shielding

elements [1]. These metals are also used in many other varieties of applications. They are extensively used as alloying metals in steel industries, sintered carbide tools in the form of respective ferroalloys and carbides and many more. Specific application such as that of niobium in the field of metallic superconductor and nuclear reactor, tantalum as miniature capacitor and tungsten as incandescent filament, molybdenum as heating element and cathode support and rhenium as alloy softener bestowed them prominent recognition. Among the various activities carried out in DAE some of important activities on niobium based materials are highlighted in the next section.

Niobium for superconducting cavities

Niobium, among all refractory metal, has lowest melting temperature, lowest density, and lowest room temperature elastic modulus. Nb becomes superconductor at cryogenic temperatures. At atmospheric pressure, it has the highest critical temperature of the elemental superconductors at 9.2 K. Niobium has the greatest magnetic penetration depth of any element. In addition, it is one of the three elemental type II superconductors, along with vanadium and technetium. Low temperature applications include superconducting cavities; tunnel barrier/ Josephson junctions in nano-electronic device; wires for superconducting magnets in the form of niobium-tin and niobium-titanium alloys.

From the DAE prospective, high performance superconducting radio frequency (SRF) cavities are crucial for the development of high energy and high duty factor superconducting LINACS required for future pulsed spallation neutron sources and accelerator driven sub-critical sources [2]. High purity Nb is an ideal choice for such SRF cavities.

The performance of these SRF cavities is measured in terms of its quality factor (Q_0) and accelerating gradient (E_{acc} in MV/m). Q_0 is inversely related to the surface resistance of the cavity and needs to be maximized to a value greater than 10^{10} . In order to improve Q_0 , fabrication and processing of the cavities is carried out in very stringently controlled processes of thermal and electro-chemical treatments. Despite such careful preparations, performances of such cavities are many a times below the theoretical limit and repeatability of the quality is not easily achievable. Hence, the SRF community continuously strives to evolve these processing parameters. One of the most essential steps towards the improvement of Q_0 is related to the reduction of ingress of bulk hydrogen during high vacuum and high temperature degassing (HVT) processes. The basic idea behind these efforts is to achieve a combined optimization of Q_0 and E_{acc} . However, the real success of such thermal treatments would only be realized when

all the treatments after the degassing cycle are eliminated and for this, various aspects associated with the vacuum degassing treatments should be understood.

In DAE, consolidated efforts have been made to reproducibility produce high performance cavities by systematically studying the ingress of various interstitial impurities by combining transmission electron microscopy and time of flight secondary ion mass spectrometry. It was unequivocally established that upon annealing under vacuum though Nb_2O_5 decomposed quickly, other sub-oxides like NbO remained stable up to high temperature. Role of other impurities like, carbon, sulphur and nitrogen in the hydrogen degassing was elucidated (Fig.1) [3]. A proposed mechanism was used to modified the treatment of the cavities which has been successfully demonstrated in producing high quality cavities being transferred to US national labs to be integrated with the accelerators (Fig.2).

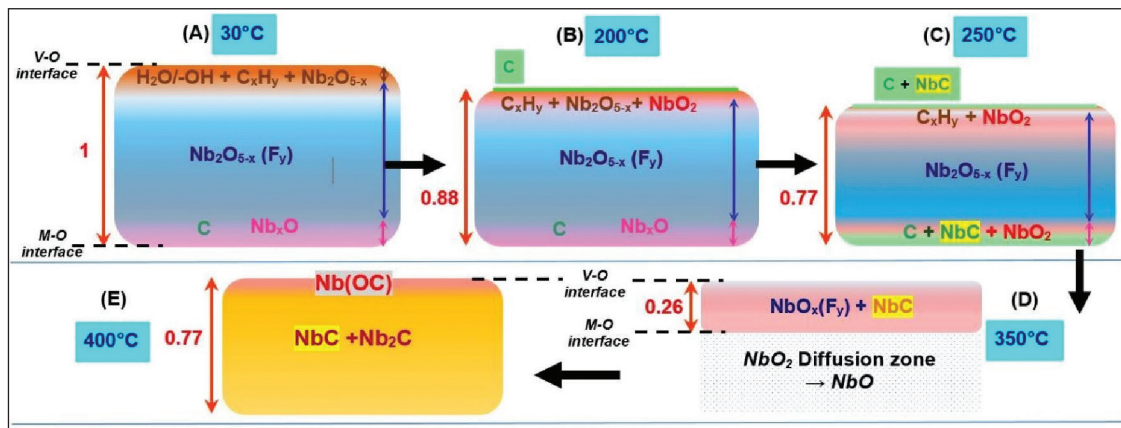


Fig. 1 : Schematic representation of the reduction of oxide layer under vacuum upon heating.



Fig. 2 : Vacuum cavities prepared in DAE and provide US national labs for accelerators.

Nb-Alloys for Compact high temperature reactors

Alloys of Nb have a good combination of high temperature strength, chemical compatibility with most liquid metals, easy fabricability, lower density and stability in nuclear environments. The strength of pure Nb is, however, known to decrease substantially above 1000°C. Various approaches have been used to improve the strength of Nb at elevated temperature. One of the best approaches to increase the strength of Nb alloys is by adding Zr and C to Nb by solid solution strengthening and precipitation hardening respectively.

Existing literature on the Nb alloy shows that deformation temperatures for the alloys are as high as ~1600°C and the recrystallization temperature as ~1480°C. This demands for the exploration of a new alternative route for deformation as well as recrystallization of the Nb alloy at lower temperatures which would make the fabricability of the alloy suitable with the existing facilities in DAE. For this purpose, Nb-Zr-C alloys were electron beam melted under high vacuum conditions which was followed by vacuum arc remelting to refine the grain-size. Preparation of the alloy needed special attention, as prior melting of Nb entire C would react with available traces of oxygen in the system and convert into gaseous form. Fig.3 shows a flow

sheet for the preparation of Nb alloy to achieve the desired alloy composition as Nb- 1% Zr and 0.1%C [4]. Vacuum arc melting which followed EB melting, the brought desirable homogeneity to the alloy. Next problem of refractory metal alloys is the requirement of high processing temperatures and prone to oxidation at these elevated temperatures. To address both the issues formability of the Nb-1Zr-0.1C alloy was addressed by a series of compression tests at different temperatures ranging from 800 to 1300°C at different strain rates up to 35% deformation (Fig.4). The flow stress of the alloy remains above 200 MPa up to 1300°C. However, in between temperature range from 600-800°C the flow stress suddenly dropped from 268 MPa to 241 and subsequently increased again up to 290 MPa. This provided a window of operation at temperatures close to 800°C [4,5].

The second problem of profuse oxidation of Nb based alloys at temperatures above 800°C was achieved by jacketing the material with copper. However, 800°C is just a warm temperature for the alloy and its strain rate sensitivity is very low at this temperature range, which indicates that the material has chances of failure during direct extrusion. Therefore, to avoid any chance of cracking of the material during working, a bore was drilled on each

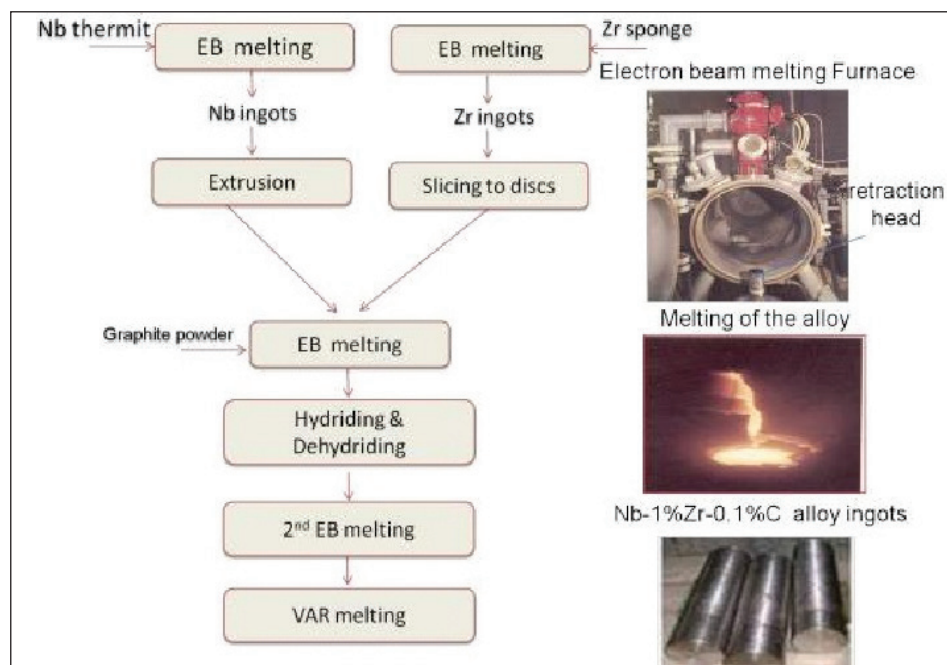


Fig. 3 : Flow sheet for the preparation of Nb-1%Zr-0.1%C alloy.

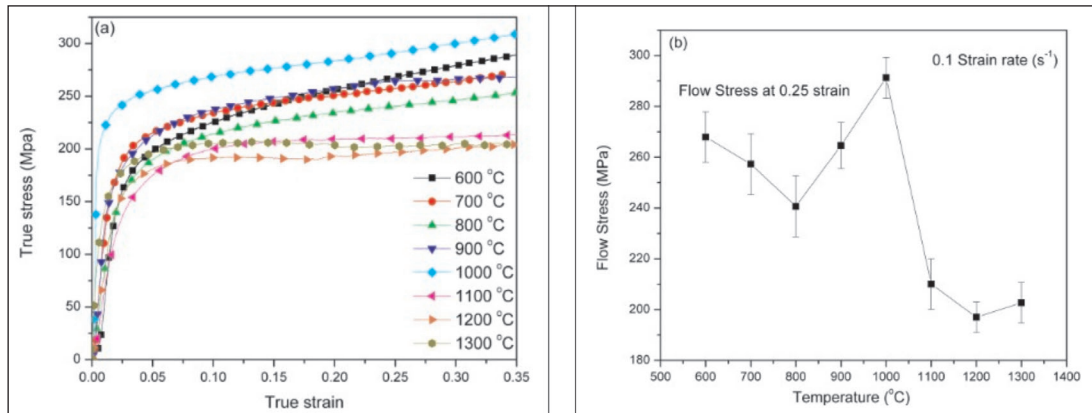


Fig. 4 : Compression (a) stress-strain curve and (b) flow stress as a function of temperature for as-solidified Nb alloy from 600 C to 1300 C at 0.1 s⁻¹ strain rate.

ingot and at 800°C extrusion of hollow ingot was carried out with the help of a mandrel. This warm deformation imparted sufficient amount of strain in the alloy which eventually helped in bringing down the annealing temperature of the alloy to 1300°C. The optimized recrystallization parameters when implemented on the large size tubes it resulted in a grain size of $28 \pm 3 \mu\text{m}$ (Fig.5) [5].

Based on the experimental studies on the effect of thermo-mechanical treatment on microstructure and properties of the Nb alloy, new flow-sheet for the low temperature fabrication of tubular products of Nb alloy has been developed and it has been successfully implemented on bulk scale to produce the Nb alloy tubular product as shown in Fig.6.

CHTR is being designed to operate at high temperatures ($\sim 1000^\circ\text{C}$) using liquid metal (Pb- Bi) as coolant. In the absence of any data on thermal hydraulics and performance of structural materials

which can sustain these temperatures, realistic designing of reactors is severely hampered. So far, all design parameters are based either on literature survey or extrapolated from the low temperature data. It is necessary to generate robust set of data on thermal hydraulics of the metal liquid phase. For this purpose, it is necessary to fabricate a test loop which can be operated around 1000°C. A high temperature liquid metal loop- named as *Kilo Temperature Loop* (KTL)-was decided to fabricate. As conventional materials like steel or superalloys, cannot be used at such high temperature, the Nb based alloy, Nb-1Zr-0.1C has been chosen to be the material for the loop component. The flow sheet developed for the fabrication of Nb tubes been successfully used for fabricating the Kilo Temperature Loop in collaboration with Nuclear Fuel Complex Hyderabad. The loop has been successfully tested at 1000°C in Pb-Bi eutectic alloy environment [6].

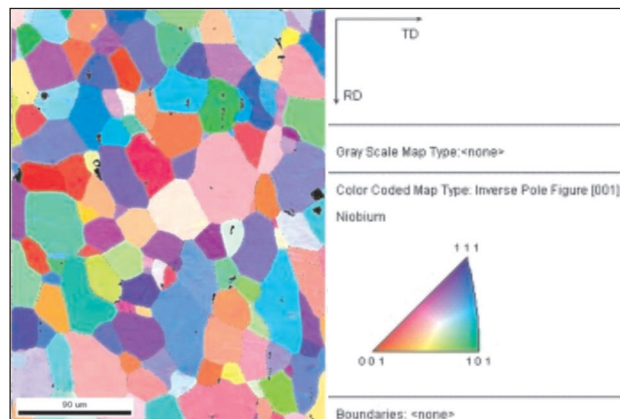


Fig. 5 : OIM micrograph of extruded Nb-1%Zr-0.1%C alloy annealed at 1300°C for 3 hrs.



Fig. 6 : Tubular product of Nb alloy obtained using low temperature deformation flow sheet.

Characterization of carbides in Nb alloy at different processing condition

Various morphologies of carbide precipitates observed in the as-solidified, deformed and annealed samples of the Nb alloy were characterized in detailed using Synchrotron X-ray diffraction (XRD), transmission electron microscopy (TEM) and high-resolution transmission electron microscopy (HRTEM) techniques [7]. Detailed analyses of synchrotron XRD and SAED (selected area electron diffraction) patterns obtained from the needle morphology (Fig.8) present in the as-solidified samples showed that precipitates are γ -Nb₂C carbide phase. Detailed analyses of high-resolution images of the phase showed the presence of coherent

interface between the matrix Nb and Nb₂C carbide phases [7]. Based on these observations formation mechanism for the Nb₂C phase was established which shows very small movement of Nb atoms and rearrangement of interstitial C atoms play a key role in the formation of the Nb₂C phase. Similarly, other carbides (needle and cuboidal morphology) present in the extruded samples were characterized by XRD and TEM (Fig.8). Based on their structural relationships it was shown that the as-solidified sample dissolved during deformation and re-precipitated in the form of (Nb,Zr)₂C and (Nb,Zr)₃C₂. As a result the sequence of phase transformation was established as: Nb₂C → (Nb,Zr)₂C + (Nb,Zr)₃C₂ → (Nb,Zr)C [7,8].

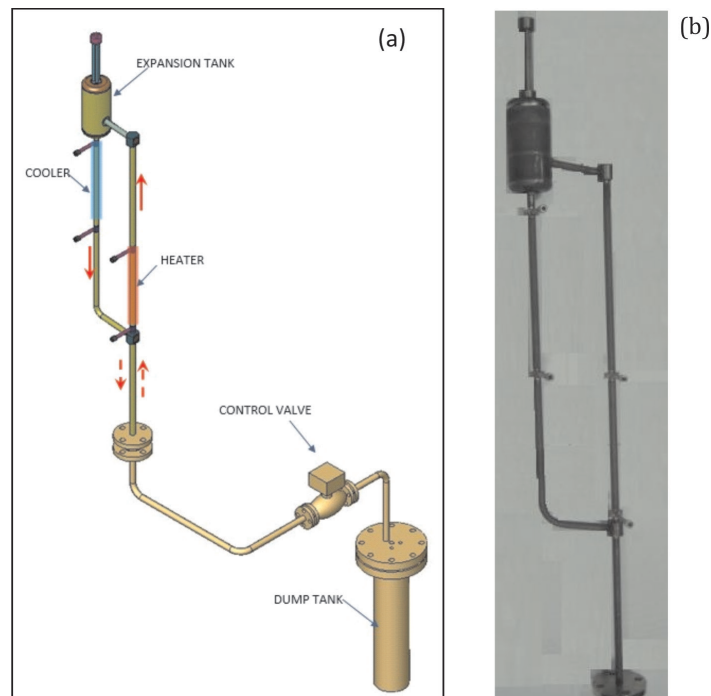


Fig. 7 : (a) Isometric view of KTL (b) Kilo temperature loop fabricated with Nb alloy

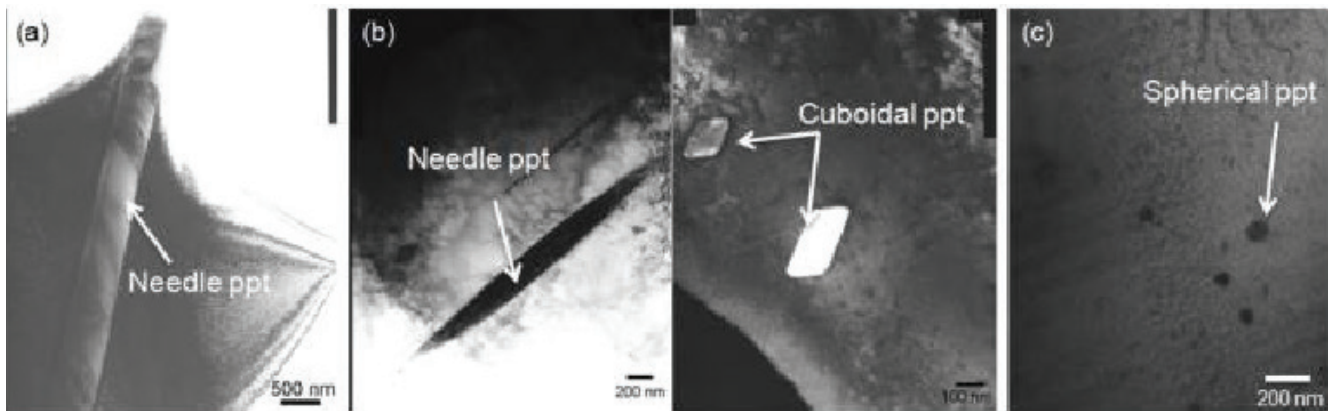


Fig. 8 : TEM micrographs of the (a) as-solidified (b) deformed and (c) annealed samples showing the presence of needle morphology, cuboidal and needle morphology, and spherical morphology carbide precipitates, respectively.

Nb Based In-situ Composites: A new approach for high temperature applications

In modern high-pressure turbines, higher entry temperature of $\sim 1600^{\circ}\text{C}$ is achieved by the use of single crystals containing large concentrations of refractory metals for strengthening, and platinum group metals for topologically close-packed phase for better oxidation resistance and environmental coating that allow substrate surface temperatures to confine up to 1150°C . It is now very unlikely that Ni-based superalloys could be used in the hottest parts of 'future' engines as they would fail to meet the stringent environmental conditions imposed by regulatory organisations. Therefore, Nb silicide-based in-situ composites are being considered for their potential applications as next-generation turbine blade materials which can operate at temperatures which are significantly higher than the current superalloys-based materials. The word 'in-situ' was coined due to the fact that at elevated temperatures (during solidifications) silicides remains in the solution but once precipitate out it remains as second phase distributed in the Nb matrix nearly upto the vicinity of solidus temperature of the alloy. The presence of the silicide phase in the Nb matrix provides strength to the otherwise extremely soft Nb matrix at elevated temperatures. Besides, at low temperatures the matrix of Nb provides sufficient toughness to the brittle intermetallic phases. In addition, Nb matrix has serious limitation in terms of high temperature oxidation resistance which is significantly improved by the silicide phase.

Therefore, symbiotic relationship between these phases makes this class of material very attractive for high temperature applications.

In the binary Nb-Si phase diagram, two phase field ($\text{Nb}+\text{Nb}_5\text{Si}_3$) is the most useful composition range where poor oxidation resistance, essentially because of the oxidation of the Nb matrix, could be improved by alloying with suitable elements like Ti, Hf, Cr, Al, B, to achieve a balance of high creep resistance, good oxidation resistance, and appropriate room- temperature fracture toughness. These alloying additions induces other phases in the alloy. Among them the most important one is the Laves phase. These phases, likes Laves and Silicides, improve the oxidation resistance of Nb based in-situ composite materials. Typical microstructure of the in-situ composites consists of uniform distribution of silicides and Laves phases in ductile Nb solid solution (Nbss) matrix (Fig.9). It has been generally observed that those elements, like Ti, which improve oxidation of the alloy, deteriorate its high temperature strength. Therefore, selection of right set of elements and their concentration in the alloy are important. Fig. 10 provides a comparison of effect of different alloying elements on the oxidation response of various Nb-Si based alloys. For the purpose of comparison Superalloys and Mo based alloys are also added in the figure. Detailed study on various alloying elements have been carried out [9,10]. Table 2 provides a list of alloying elements used in the study of the development of in-situ composites in DAE.

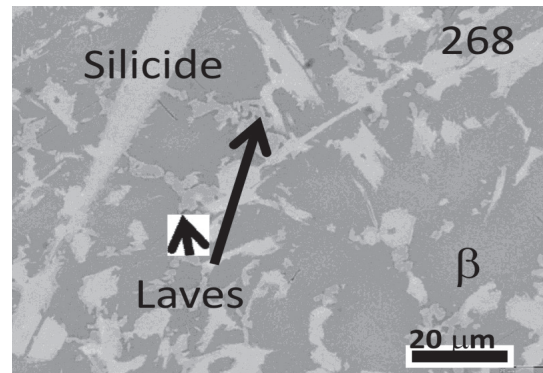


Fig. 9 : Typical distribution of phase in in-situ Nb composites [9]

Between the alloy 266 with W and alloy 268 without W, immediate effect of W could be realized. From figure 11 it can be seen that W has significantly refined the microstructure. Similarly, comparison between the microstructures of 266 and 2404 clearly shows that upon reducing Cr concentration below 7%,

formation of Laves phase was suppressed. Absence of the Laves phase has significantly reduced the oxidation properties of the alloy. Upon increasing Cr above 7% and adding Zr, Hf and Mo (2534) or adding Fe, B, W, Sn, oxidation properties could be restored.

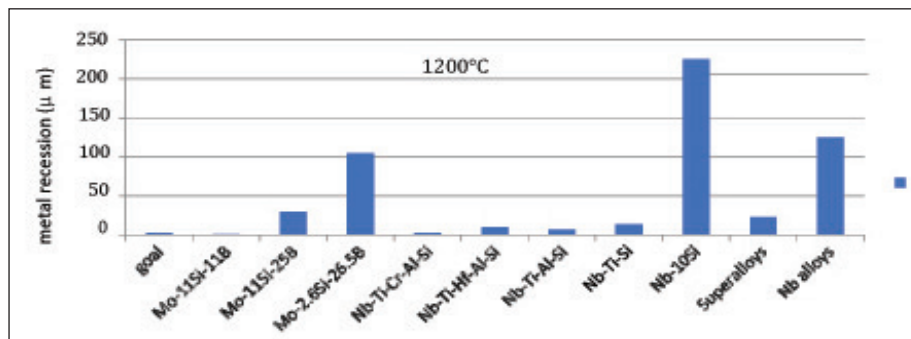


Fig. 10 : A comparison of the properties of various in-situ composite alloys.

Table 2 : Composition of various alloys												
Alloy	Composition (at %)											
	Nb	Ti	Si	Al	Cr	Zr	Hf	Sn	W	Fe	B	Mo
266	33.9	29.05	7.73	10.06	10.18	3.65	3.08	1.32	1.03			
267	33.62	29.38	8.39	9.98	9.97	3.4	3.02	1.0	1.25			
268	33.42	29.48	7.86	10.17	10.42	4.03	3.71	0.9				
269	33.9	28.9	8.33	10.16	10.29	3.74	3.56	1.12				
2402	41.25	30.02	10.01	10.06	6.96	--	--	--	1.49			
2403	36.28	35.11	10.00	9.95	6.96	--	--	--	1.49			
2404	46.32	25.01	10.01	10.00	6.95	--	--	--	1.5			
R2505	31.99	35.01	12.0	10.0	7.0	--	--	1.0	1.0	1.0	1.0	
R2506	26.99	35.01	12.0	10.0	5.0	3.0	3.0	1.0	1.0	1.0	1.0	
R2534	32.65	12.76	14.28	10.20	7.66	5.10	5.10	--	--	---	2.04	10.21
R2535	32.04	35.01	9.00	10.00	9.0	---	---	1.5	1.5	1.0	0.7	

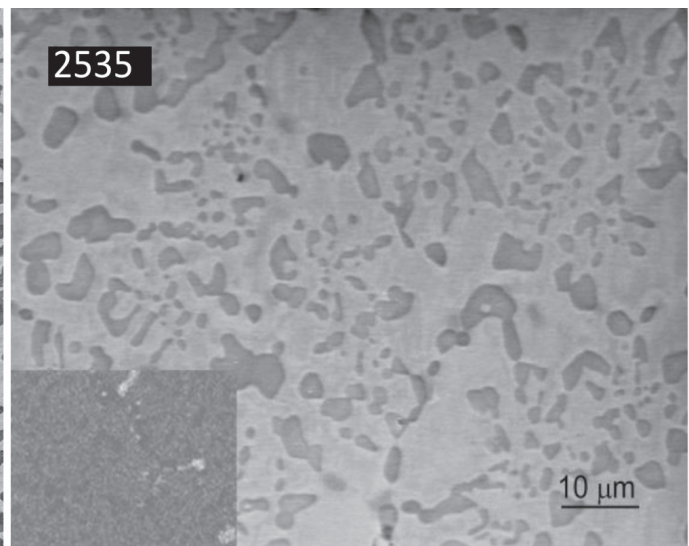
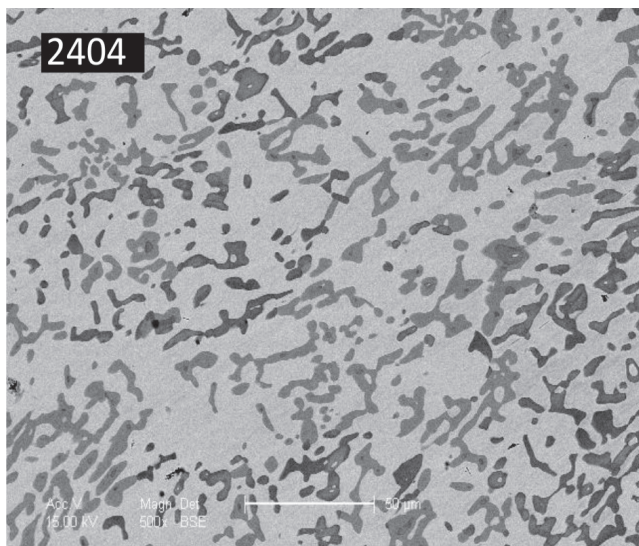
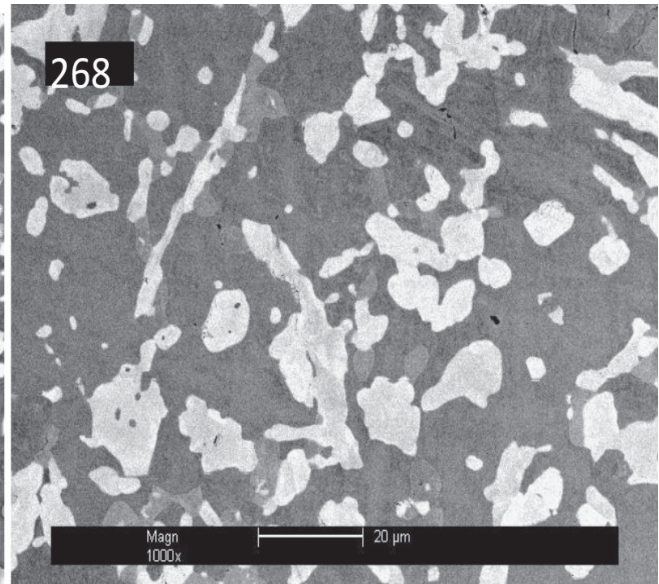
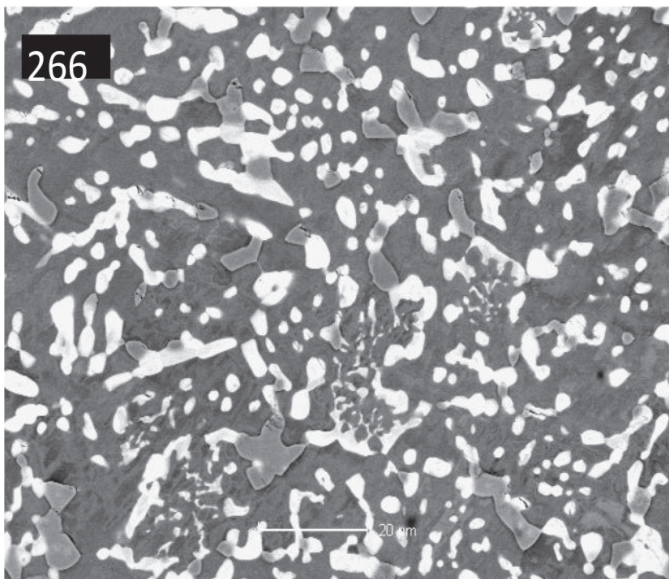
Based on detailed study comprising various configuration of elements it was observed that :

- (i) Addition of Ti beyond 35% in the alloy induces tendencies of phase separation.
- (ii) Al could be a good alloying element but if its concentration increases more than 7%, formation of Nb₃Al phase significantly reduces the room temperature ductility of the alloy.
- (iii) Minimum 7% Cr is needed for improving the oxidation of the alloy.
- (iv) Hf and Zr should be as low as possible.
- (v) Fe, B and Sn have positive effect on the

oxidation properties of the alloy.

- (vi) Addition of small quantity of Mo improves the strength significantly.
- (vii) W addition refines the grain size but formation of WC precipitates is not noticed.

When the oxidation of these alloys were compared with those reported in literature, it was observed that these alloys offer better oxidation properties. In addition, low working temperature of 1300°C make these alloys amenable to good formability. Typical 0.2% YS of 275 MPa close to 1000°C make them an attractive choice for many structural applications [9,10].



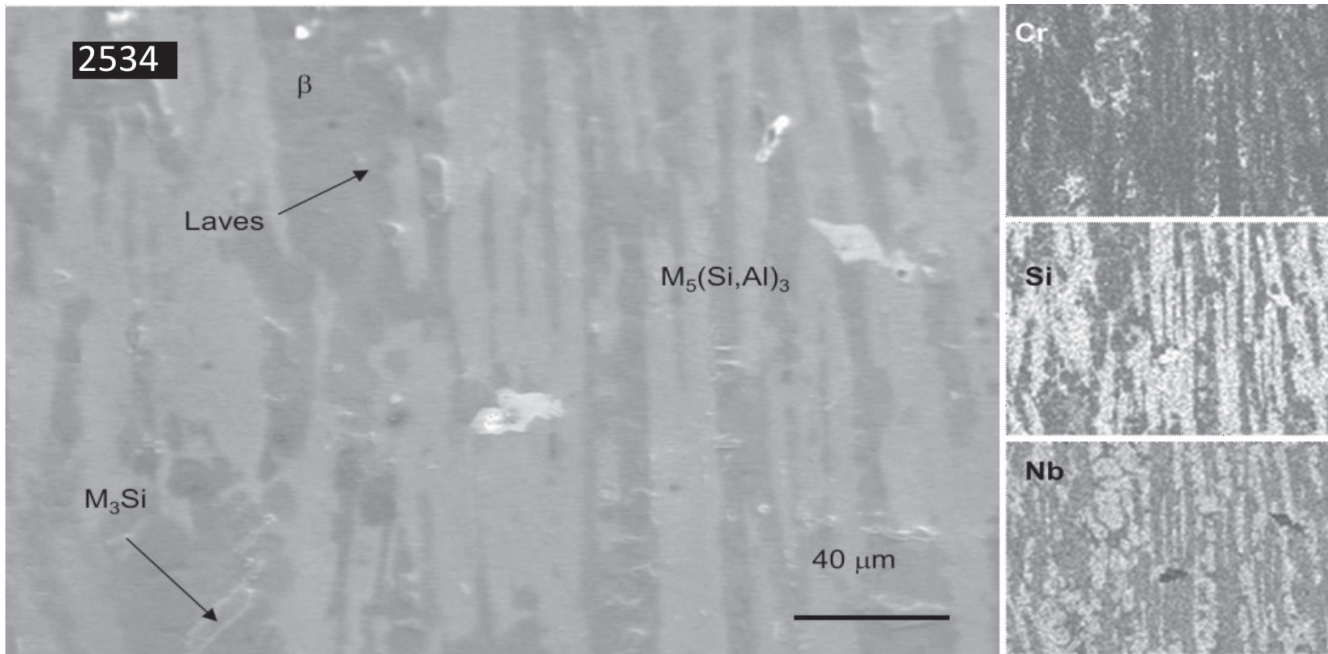


Fig. 11 : Microstructures of various homogenized alloys listed in Table 2.

Table 3 : Comparison of various Nb based in-situ alloys

Alloy composition	Temperature °C	Time(h)	Oxidation weight gain (mg/cm ²)
Nb-8Si-11Al-15Ti	1000	100	120
CMSX 10 Ri	1177	100	88
PWA 1484	1177	100	26
41.2Nb-15.2Si-23Al-23Ti-4.7Hf-11.2Cr-4.7Ge(UES-AX)	900	100	-400
Nb-24Ti-16Si-6Al-6Cr-2Hf-(NbSi ₂ coatings)	1250	80	11.7
Nb-25Ti-13Si-2Al-3Cr-2Hf- 0.3Sn-5Ge-3Fe	1000	60	~-48
Nb-25Ti-13Si-2Al-6Cr-2Hf- 0.3Sn-5Ge	1000	100	-12
Alloys in the present study	981	100	8

Points to be noted

Nb based alloys have attractive properties for much wider applications. However, the cost of the Nb is one major deterrent for its usage for various applications. In spite of that a deep understanding of the Nb-based alloys in terms of oxidation properties, precipitation of various phases and their influence on high temperature properties has been carefully examined. Suitable environmental barrier coatings, to improve oxidation resistance could be another approach to address the high temperature oxidation issues.

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Report
IIM-ATM 2023 & NMA 2022

The Indian Institute of Metals (IIM) hosts the Annual Technical Meeting (ATM) every year, which serves as a showcase event for the Indian metallurgical and materials scientific communities. This year IIM held its 77th Annual Technical Meeting from November 22nd to November 24th, 2023, @ KIIT Deemed to be University (KIIT), Bhubaneswar, Odisha. It was organised by the IIM Angul Chapter, IIM Bhubaneswar Chapter, and IIM Sambalpur Chapter in association with Hindalco Industries Ltd. and KIIT Deemed to be University. Shri Pradeep Kumar Jena, IAS, Chief Secretary of Odisha inaugurated ATM 2023 in the presence of Shri Hemant Sharma, IAS, Principal Secretary Industries, Govt. of Odisha, Shri Satish Pai, President, IIM, Shri Sajjan Jindal, VP, IIM, Prof. B S Murty, VP, IIM, Brig Arun Ganguli (Retd), Secretary General, IIM, Shri Amarendu Prakash, Chairman, SAIL and Shri S S Mohanty, Chairman, COC, IIM-ATM 2023. Around 1400 delegates attended the inaugural ceremony. Several others also participated online via the virtual platform on the website (www.iimatm.org). The welcome address was given by Prof. B S Murty.

Following the inaugural ceremony, an International Symposium on "Sustainable Transformation in Metal Industry" was held in hybrid (Online + Physical) mode. On Day 1, five distinguished global

speakers delivered plenary talks at the International Symposium. The entire conference was planned to reflect the sustainable change in the development of materials and industrial processes, and it was warmly appreciated by the participants. The physical event took place in KIIT's main convention hall. During the International lectures, Dr. Akshaya Kumar Padhi from Apple attended the event in person and talked about Cathode Materials for Lithium-ion Batteries. After Dr Padhi, Prof. Ragnhild Elizabeth Aune of the Norwegian University of Science and Technology (NTNU) gave a physical presentation on Recycling Li-Ion Batteries - A Crucial Step Towards Sustainability. Next, Novelis's CTO, Mr Philippe Meyer, took the stage to discuss on Aluminium as a material of choice for the transition of the Automotive industry towards Carbon Neutrality. These international speakers attended the vent physically whereas the next 2 speakers attended virtually. Prof. Veena Sahajwalla of the University of New South Wales (UNSW) delivered her presentation online on A smart vision for a sustainable future: SMaRT technologies and MICROfactories™ for creating sustainable materials and products from waste. Dr Subodh Kumar Das, Founder and CEO of Phinix LLC, USA also attended online and spoke about Aluminium Sustainability - Decarbonisation & Beyond.



Shri Satish Pai inaugurated the Technical Exhibition. 35 companies from various sectors like steel, aluminium, safety, material processing, refractory, innovation, furnace etc. participated in the exhibition. Foreign companies also participated in the exhibition. 900 sq mtr Expo area was made available for all the exhibitors. Some of the key exhibitors are Hindalco, JSW, Tata Steel, L&T, Elemch, Swastik Furnace, Siemens, Fives Group, Danieli, FLSmidth, Praj Industries etc.

Poster session was inaugurated by Shri S S Mohanty, former President, IIM and Chairman, Core Organising Committee, IIM-ATM 2023. A total 200 posters were presented in the poster session. Octanorm panels

with lighting and standardised orientation formats were used for the posters.

Next came the National Metallurgist Award (NMA) ceremony. Shri Faggan Singh Kulaste, the Hon'ble Minister of State for Steel and Rural Development, Government of India, presided over the event as the chief guest. Shri Nagendra Nath Sinha, Secretary, Ministry of Steel was the Hon. Guest. Shri Parmjeet Singh, the department's additional industrial adviser (technical division), was the Special Guest. The customary lamp lighting and prayers in front of Lord Jagannath marked the beginning of this ceremony. Shri Satish Pai, President, IIM greeted the guests.



Students and young professionals attended a Career Inspirational Session that was held simultaneously in the Seminar Hall next to the Convention Hall. **“Career Navigation in the Metals and Materials**

Sector” was the session's theme. Speakers at the event were Shri Amarendu Prakash, Chairman of SAIL, Dr Ramanuj Narayan, Director of CSIR-IMMT and Ms Kopal Agrawal, Joint President of

Strategic Procurement at Hindalco Industries Limited. Approximately 200 students and young professionals attended this session.

After that, IIM Awards & Sustainability Awards, JRD Tata Award and Book Launch were followed.

The Awards function was followed by the three Memorial Lectures. Prof. N P Gandhi Memorial Lecture was delivered by Prof. VS Raja, Institute Chair Professor, Dept. of Metallurgical Engg. & Materials Sc. IIT Bombay, Dr. Daya Swarup Memorial Lecture was delivered by Prof. N K Mukhopadhyay, Professor, Department of Metallurgical Engineering, IIT BHU and G D Birla Gold Medal Lecture was delivered by Dr. Raghvendra Tewari, Outstanding Scientist & Associate Director, Materials Group Head, Materials Science Div., BARC.

On 22nd November and 23rd November, two CEO panel discussions were held where many industry leaders like Shri Amarendu Prakash, Chairman, SAIL, Shri Lokendra Raj Singh, COO, JSW, Shri Debasish Bhattacharya, VP, Technology and R&D,

Tata Steel, Dr. Sanak Mishra, former President, IIM, Shri Atanu Bhowmik, Director-in-charge, SAIL-RSP, Shri Kailash Pandey, President & Cluster Head, Hindalco, Shri Kumaresan T, EVP, L&T, Prof. Kumar Mohanty, Director, Corporate Relations, KIIT, Mr Daniel Brunelli Brondex, Country Head, India, Fives Group and Shri Sunil Gupta CEO, Aluminium, Vedanta participated and discussed on sustainability in manufacturing industries and their approach towards a green eco-system.

Before dinner on the 22nd and 23rd, there were cultural programs scheduled. Odisha's traditional dance and signing were showcased on the 22nd, infused with a touch of contemporary style. About 1000 individuals showed up, and everyone seemed to like it. Everyone was invited to a gala dinner on the 23rd, which was held in the elegant Crystal Crown. Both before and during the meal, there was contemporary dance and singing. Approximately 1400 individuals attended the gala dinner. Everyone had fun, and even joined the artists in dance.



Students' Interaction (23 November 2023)

President, IIM along with members of Apex Committee and former Presidents had an interaction with Student community who had come to attend IIM-ATM 2023 at KIIT Bhubaneswar on 23 Nov 2023. The event was organised at the sidelines of other events which were scheduled earlier.

During the interaction, following points emerged which are as given under:

- (a) There is a need for IIM to visit various colleges/ institutes where Metallurgy is taught to the students such that they can be attracted to join IIM under Catch Them Young Banner.
- (b) It was felt that the need of Students is very different from various Professionals who join IIM.
- (c) Executive Committees in various Regular Chapters must have representation from Students as Members /Invitees.
- (d) Students are not guided mentored properly by the seniors. Focus must be on Third and Final Year Students who can be motivated to join IIM.
- (e) Proposal of waiver of Subscription Fee for admission as Student Member.
- (f) Need of regular VC Meeting of Apex Committee with Student Affiliated Chapters where there is maximum attendance of Students.
- (g) Amongst the Social Networking sites, Instagram is most sought after by the Student Community and hence IIM's focus on media blitzkrieg should be more on Instagram to reach out

The meeting ended with a vote of thanks to everyone.

to them effectively. WhatsApp Group of IIM Student Community can be considered.

- (h) IIM Metal News does not reach to them as same is not being sent as bulk email to individual Student members. Provisions does exist to see Metal News from IIM Website after having duly logged in with credentials.
- (i) Students with research orientation bent of mind should be assisted and advised to get into Universities Ph.D. programs. Top 5X Students could be guided and prepared for their interviews for Ph.D. programs.
- (j) Forum to give guidance to Students to become Start-Up Entrepreneurs.
- (k) Few Stalls to be kept reserved for Students Start-Ups during conduct of IIM-ATM event.
- (l) Travel Allowance for Students for attending the IIM-ATM event as per rules and terms to be formulated by IIM.
- (m) Organizers of IIM -ATMs to cater for Student's accommodation in Hostel/Guest Houses with nominal payments.
- (n) One of the Vice President of IIM can be made responsible for Student Membership such that during his four years tenure he can effectively bring change.
- (o) Special Talks on Career Guidance by Student Affiliated Chapters to their Student members.
- (p) Free membership to Student Undergraduates for first two years. Ph.D. Students not to be considered as Student members anymore.



(1st row from right: Dr. Sanak Mishra, Former President, IIM, Dr. Amol A Gokhale, Former President, IIM, Prof. B S Murty, Vice President, IIM, Mr. Satish Pai, President, IIM, Dr. Komal Kapoor, Vice President, IIM, Dr. U Kamachi Mudali, Former President, IIM, Brig. Arun Ganguli (Retd.), Secretary General, IIM, Mr. Somnath Guha, Treasurer, IIM) (2nd row: Students from different Students' Chapter of IIM)

Chapter's Conclave

CRC Meeting

The Chapter's Conclave was hosted in hybrid mode on 23rd November 2023 at 1100 hrs, chaired by Mr. S. S. Mohanty, Chairman, Chapter Relations Committee (CRC). Representatives from CRC, IIM Chapters and Head Office were present.

A. The Chairman, Chapter Relations Committee (CRC) welcomed all members and initiated the proceedings with a request for points arising from the previous meeting in July-2023 and actions taken thereof. These were presented by Shri Tamal Goswami from Head Office. Dr. Chiradeep Ghosh (Convener/Secretary, CRC) briefed about the number of chapters presenting in the CRC meeting and the overview of the chapter's representation for last few years. A total of 26 chapters (11: Large, 7: Medium, 8: Small) participated/sent PPT in the CRC Meeting held on 23 November 2023.

Regarding membership drive, HO informed that it had been suggested to the chapters to conduct membership drive in a regular interval and encourage the professionals to be the IIM Member. In recent years, IIM HO has visited 37 chapters for membership drive. The total number of members in IIM (as on 31st Oct, 2023) is 7678 (life member: 6705).

B. HO/Chapters presentations and Deliberation

- ✓ IIM HO presented a few points for chapters, followed by discussion in the CRC meeting:
 - (a) sending monthly activity report regularly, (b) convene AGM by June each year and intimation of re-constitution of EC to head office, (c) post signing of MoU between HO and respective chapter, the account to be closed and audited within 3 months and subsequent surplus to be shared with HO (specified ratio).
 - (b) IIM HO suggested to have half yearly as well as yearly audit by November and June every year from FY 2024-25. The suggestions also include that important document (property related, assets related, finances related) to be shared with HO for safe-custody and repository.
 - (c) In addition, it was suggested that chapters to achieve annual allotted targets as approved by the council in their membership drive (as a regular activity at least once in a Quarter). In addition, it was suggested to pursue the defaulters to revive the membership.

There were some more suggestions from chapters: IIM Kanpur Chapter suggested to enhance the student membership by doing more activities and connecting through social media by highlighting the advantages of joining IIM community. IIM Rourkela Chapter pointed out that new recruits have shown more interest and have joined IIM as life members. On increasing the number of members in industries, Kalinganagar chapter representative mentioned about a couple of ways by which they are able to add about 100 members per year. The chairman also suggested that more seminars, certification courses can be also done to increase the visibility of IIM.

- (d) It was suggested that IIM HO will plan and carry out regular chapter visits with primary agendas being membership drive by chapters, GST, regularization of finances, various compliances etc.
- (e) GST Registered Chapters to provide soft copies of all invoices of all output/ input transactions to IIM HO on weekly basis as Input Tax Credit (ITC) cannot be claimed without details of invoices as per audit regulations.
 - ✓ Dr. Sudhanshu Singh (Co-Chairman, CRC) presented on six headings, namely, (i) Activities completed, (ii) Financials, (iii) IT / networking strategies, (iv) Future plans and long-term vision, (v) major success and (vi) area in which excellence is wished to be attained. Most of the attending chapters have done lots of activities and were observed to be sound in terms of finances.
 - ✓ Secretary General, IIM mentioned about having a dynamic way of evaluating parameters for best chapter award.
 - ✓ Chairman, CRC requested all the chapters to encourage the new startups for applying in the IIM-Materials Technology Start-up award.

C. Suggestions from the Chairman, CRC

Suggestions from the Chairman included conducting aggressive membership drive including student membership. In addition, the Chair suggested that IIM Chapters should get connect to industries and bring them the gambit of IIM as professional members.

Mr. Mohanty, Chairman CRC concluded the meeting thanking members for their active participation.

Chapter's Conclave - Participants

CRC: Mr. S. S. Mohanty, Dr. S. S. Singh, Dr. C. Ghosh, Brig Arun Ganguli (Retd)

Participating Chapters: Bhubaneshwar, Pune, Kalpakkam, Durgapur, Rourkela, Delhi, Bhilai, Jamshedpur, Visakhapatnam, Mumbai, Kolkata, Coimbatore, Bokaro, Sambalpur, Varanasi, Vijayanagar, Chennai, Trivandrum, Kalinganagar, Goa, Jaipur, Nagpur, Kharagpur, Dolvi, Kanpur, Sunabeda

IIM Head Office: Mr. Tamal Goswami

NMA 2022
Under The Aegis of MoS, GOI
Lifetime Achievement Award

Prof. U Kamachi Mudali, Vice Chancellor, Homi Bhabha National Institute, Mumbai affiliated to Department of Atomic Energy (DAE). Formerly Distinguished Scientist of DAE; Chairman & Chief Executive of Heavy Water Board (HWB) at Mumbai; Director of Materials Chemistry & Metal Fuel Cycle at Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam, Vice Chancellor of Vellore Institute of Technology at Bhopal, is awarded the Lifetime Achievement Award-2022.



Prof. Uthandi Kamachi Mudali is a renowned Metallurgist & Materials Engineer who has made pioneering contributions in the development of Advanced Materials, Coating Technologies, and Corrosion Prevention and

Control Methodologies, for over four decades. Dr. Mudali has pursued stellar research in the field of advanced and specialty materials, championed never-before innovations in materials and corrosion engineering, and taken over the mantle of various Indian think tanks. A global leader in corrosion science, technology and engineering with 12000 citations, 280 i-index and 50 h-index, Dr. Mudali has held important positions in industry, R&D and academia.

Prof. Mudali has been instrumental in materials selection, design improvement, quality fabrication and sustained performance of various components for fast breeder reactor and associated fuel cycle facilities of the Department of Atomic Energy at Kalpakkam. He has introduced novel surface treatments and modifications using laser and ion beams to produce homogeneous microstructures, resulting in higher corrosion resistances of steels, stainless steels, titanium etc. At Heavy Water Board, Prof. Mudali has initiated non-nuclear applications of heavy water for societal applications, by signing collaborative agreement with Indian industries under "Make in India", and successfully developed indigenous deuterated compounds.

Prof. Kamachi Mudali is a Global Scientific Leader, an innovative path breaker, and an impeccable mentor in advancing India's R&D capabilities, and has put in remarkable efforts for implementing many R & D projects of immense value to the nation.

Ministry of Steel, Government of India is proud to honour Prof. U. Kamachi Mudali with the the highest Award instituted by Ministry of Steel, the Lifetime Achievement Award for the year 2022, for his valuable and path-breaking research and contributions to the Metallurgical and Materials field over the last four decades.

National Metallurgist Award

Dr. Debashish Bhattacharjee, Vice President Technology and R&D, Tata Steel Ltd. is awarded the National Metallurgist Award-2022 in recognition of his outstanding contributions to Industry and R&D.



Dr. Debashish Bhattacharjee, is a leader in Development of sustainable technologies and materials. He leads teams that work in both Business and Technology Development. Dr. Bhattacharjee sets direction and mentors teams

to develop new processes, products and business in steels, polymer matrix composites, advanced ceramics and graphene. His personal Contribution to Technology Development spans areas including mineral beneficiation, value from waste of mines and industrial plants, generation, storage and utilization of green hydrogen, carbon dioxide capture and utilization, application of artificial neural networks in process control and novel processes for coatings.

Dr. Bhattacharjee has more than 50 peer reviewed international journal publications, more than 20 patents, and 5 co-authored books. He is a Fellow of the Indian National Academy of Engineering, and The Indian Institute of Metals. He is also Visiting Professor at Imperial College, London, Industry Professor at University of Warwick and Guest Professor at University of Science & Technology, Beijing.

Award for R&D in Iron & Steel Sector

Dr. Rameshwar Sah, General Manager, Research & Development Department, JSW Steel Ltd., Vijayanagar Works, Ballari, Karnataka is awarded the Award for R&D in Iron & Steel Sector-2022 in recognition of his phenomenal & seminal contributions towards developing and implementing a number of technologies at JSW Steel leading to cost reduction, quality and productivity improvements, energy saving, process improvements and environment protection.



Dr. Rameshwar Sah has been at the forefront of developing and implementing numerous process improvements and technologies at JSW Steel. These have resulted in cost reduction, improvements in quality and productivity, lower energy consumption and positive impact on the environment. Some of the major achievements of Dr. Sah are: • Successful demonstration of BHQ ore processing at 40 TPD Pilot Plant scale and upgrading of the ore from 35% to 63% Fe content with 65% iron recovery, • Developing a novel beneficiation process for enhanced iron recovery from tailings at the 4 MTPA capacity plant running at JSW Steel since 2018, • Developing process flow sheets for beneficiation of low grade iron ores from JSW mines in Karnataka and Odisha, • Played a key role in reducing the coke rate from 395 kg to 310 kg/thm through 210 kg/thm PCI in blast furnaces.

Young Metallurgist Award [Environment Science]

Dr. Niloy Kundu, Principal Researcher, Tata Steel Limited, Jamshedpur is awarded the Young Metallurgist Award [Environment Science] - 2022.



Dr. Niloy Kundu is a visionary researcher in the field of sustainable future development with zero carbon emission. His focus area of work has been in Carbon capture, Utilisation and Storage. He was involved in establishing a 5 tpd CO₂ capture plant from blast furnace network and utilization of the CO₂ through catalytic route. Dr. Kundu is involved in plant trials to separate and

recover oil from CRM scum. He is also involved in waste water treatment and recovery of magnetic nano materials from CRM waste. The nano-materials will be used as magneto-rheological fluid and can be used in medical devices and in Automotive Industry.

Dr. Kundu's research goal also lies in achieving net zero emission, in line with Tata Steel's aspirational goal of achieving less than 2 tCO₂/tcs emission by 2025, which is based on India's stated long-term goal of reaching net-zero by 2070.

In recognition of his exemplary contributions in the field of Carbon capture, Utilisation and Storage, Dr. Kundu is conferred the Young Metallurgist Award (Environment Science).

Young Metallurgist Award [Metal Science]

Dr. Agilan Muthumanickam, Scientist SE, Vikram Sarabhai Space Centre, ISRO is awarded the Young Metallurgist Award [Metal Science]- 2022 in recognition of his significant research contributions in the area of indigenous development of joining technology for aerospace materials used in ISRO launch vehicles.



Dr. Agilan Muthumanickam has made significant contributions in the field of welding and joining of aerospace materials, related to the research and realization of satellite launch vehicle structure and parts. Few of his notable accomplishments are as follows : • Developed friction stir welding (FSW) technology for advanced Al-Li alloys for propellant tanks of satellite launchers. Parameters optimised by him produced high strength and high-quality welds.

- Developed critical brazing technology for joining of metal to ceramics for Li-Ion batteries. During this development, various technical issues were encountered which were addressed by him. His contributions helped to produce the hermetic sealed joints with required properties.

- Contributed to the development of brazing technology for reefing line cutter for Gaganyaan. With the optimized process parameters developed by him, scale-up production has been achieved.

IIM Awards 2023 The flagship event of The Indian Institute of Metals

IIM-JRD Tata Award

IIM-JRD Tata Award for 'Corporate Excellence in Metallurgical Industries' is conferred on **Mr. TV Narendran**, CEO & MD, Tata Steel Ltd.



Mr. T V Narendran has over 35 years of experience in the Mining and Metals industry. He epitomizes the core values of Tata Group and has stayed committed to a purpose-driven growth. Under his leadership, Tata Steel has witnessed substantial growth, doubling its capacity in India over the last decade through a strategic blend of organic and inorganic expansions. His tenure has been marked by steadfast commitment to responsible business with a net zero target by 2045, the most ambitious target adopted by any major steel company globally. Beyond the confines of Tata Steel, Mr. Narendran has played pivotal roles in leading industry associations, having served as the President of Confederation of Indian Industry and the Indian Institute of Metals.

IIM Honorary Membership

The Honorary Membership of IIM is conferred on **DR. SV Kamat**, Former President, IIM [2022-23] and Secretary DDR&D and Chairman Defence Research and Development Organisation.



Dr. Kamat completed his B. Tech. (Hons) in Metallurgical Engineering from IIT Kharagpur in 1985 and PhD in Materials Science and Engineering from The Ohio State University, USA in 1988 and joined DRDO in 1989.

Dr. Kamat has provided leadership and direction to several critical materials programmes in DRDO such as development of high strength steels for naval ship hulls, development of fused silica radomes for missile seekers, these have found use in various systems being developed by DRDO laboratories. During his tenure as the President of IIM (2022-23), Dr. Kamat has contributed immensely as in various spheres.

IIM Honorary Membership

The Honorary Membership of IIM is conferred

on **Mr Kushal Saha**, Former Secretary General, IIM (2018-23).



Mr Kushal Saha completed his B.Tech from IIT Kharagpur and Post Graduate in Management from XLRI. Mr. Saha brought with him an impressive and well-rounded 35+ years of expertise in Engineering & General Management domain when he joined IIM in 2018. With his able leadership at IIM HO, IIM could manage whole operation in online manner, remotely during pandemic times. Mr. Saha's contributions and efforts helped IIM in opening 3 New Chapters and reviving of 5 Dormant Chapters during 2018-2023. Mr. Saha contributed immensely during the Platinum Jubilee of IIM in 2020-21.

IIM Honorary Membership

The Honorary Membership of IIM is conferred on **Dr. Debasis Mukherjee**, Former ED & In-charge, RDCIS, SAIL, Ranchi.



After graduating in Metallurgical Engineering in 1974, from Bengal Engineering College, University of Kolkata, Dr. D Mukherjee completed his Ph.D. in 1978 from School of Metallurgy and Materials, University of Birmingham, U.K, under the guidance of Professor R. E. Smallman. He thereafter joined the R&D Centre for Iron & Steel, Ranchi, SAIL, in 1978. He has made significant contribution in development and commercialisation of a large number of value-added special steel products from SAIL. He has 19 patents to his credit. Dr. D Mukherjee had a long, active and pleasant association with IIM for almost four and a half decades starting from 1978.

IIM Tata Gold Medal

The Tata Gold Medal for the year 2023 is awarded to **Mr. Bibhu Prasad Mishra**, Advisor, Manufacturing Center of Excellence, Hindalco Industries Ltd.



He is a highly experienced technocrat with renowned presence

over 38 years in Metal and Mining Industry and extensive global experience in reputed leading Aluminium producing conglomerates. Mr. Mishra's contributions to the metal and mining industry includes his association with commissioning of 3% of Global Aluminium capacity of global repute in India as well as outside India. Mega green field Aluminium Smelter projects of Nalco - Angul, Aditya Aluminium - Hindalco, BHP Billiton's MOZAL in Mozambique, Aluminium Bahrain (ALBA) are some of his projects to mention in this context.

IIM G D Birla Gold Medal

The **G D Birla Gold Medal** for the year 2023 is awarded to **Dr. Raghvendra Tewari**, Outstanding Scientist & Associate Director, Materials Group Head, Materials Sc., Division, Bhabha Atomic Research Centre, BARC.



The work of Dr. Raghvendra Tewari on the Nb based alloys needs special attention where for the first time in India refractory-metal based alloys and in-situ composites were developed on a commercial scale for Gen IV nuclear reactors. Under his leadership an innovative fused salt electrolysis method for producing Pb-Li eutectic alloy for fusion reactors has been developed. International patents have been awarded and the technology is transferred for its mass production. A forced circulation loop carrying Pb-Li has been successfully erected.

IIM TSL New Millennium Award

The **IIM TSL New Millennium Award** for the year 2023 is awarded to **Mr. Sharad Raghunath Suryawanshi**, Executive Director (Works), SAIL, Rourkela Steel Plant.



Mr. S R Suryawanshi is well regarded in the iron making sector as a specialist in Blast Furnace Technology. His illustrious career spanning over 36 years in Rourkela and Bhilai Steel Plants of SAIL is studded with several remarkable achievements. His outstanding achievements include commissioning and stabilization of India's largest Blast furnace BF-5, in RSP in a record time. He played a pivotal role in achieving the fastest hot metal production milestone of 7 Million Tons in Blast Furnace #8 of BSP, SAIL. As

Chairman of IIM Rourkela Chapter, Sri Suryawanshi undertook new membership campaigns and organised several Webinars, Technical Talks and Seminars, including an International Conference in Rourkela.

IIM Hindustan Zinc Gold Medal

The **Hindustan Zinc Gold Medal** for the year 2023 is awarded to **Ms. Vaisakhi Salil Nandi**, Senior Manager, Central Materials and Processes Laboratory, Foundry and Forge Division, HAL, Bangalore.



Ms. Vaisakhi Nandi is working in HAL since 2002 and presently she heads the Metallurgical Testing area of Central Laboratory of HAL-Foundry and Forge Division. Her involvement in HAL's indigenization program under Atmanirbhar Bharat mission has resulted in considerable foreign-exchange savings and more importantly strategic self-reliance. She is an expert in failure analysis and her knowledge in metallurgical investigation of in-service and process failures of aeronautical components has averted repetition of premature failures resulting in enhancement in life and reliability of the components.

IIM Essar Gold Medal

The **Essar Gold Medal** for 2023 is awarded to **Dr. T Bhaskar**, Chief Technology Officer, Tata Steel long Products.



Dr. T Bhaskar has over 3 decades of rich professional experience in diverse areas in Integrated Steel plants in Operations, Steel Making, Quality Assurance, Process Control, Projects, Quality Systems, TQM, and others. Over his career, He has made significant Metallurgical contributions in Tata Steel. He has played a key role in positioning TSLPL as one of the Best Speciality Steel Plants in the country with a 1 million tonne capacity of Specialty Steel. He is also an active member of IIM Jamshedpur chapter Executive Committee and played a key role in making it one of the Best chapters in the country in the last decade.

IIM Mecon Award

The **IIM Mecon Award** for 2023 is awarded to **Ms. Sutanwi Lahiri**, Scientific Officer E, BARC.



Ms. Sutanwi Lahiri has joined Beam Technology Development Group, Bhabha Atomic Research Centre, as a Scientific Officer from the 53rd batch of BARC Training School, Mumbai. She made significant contributions

in the process development, equipment design, installation, commissioning of subsystems for a laser and electron beam based separation technology. These facilities were indigenously built overcoming non-availability of information in open domain. She has also developed a novel decontamination technique based on ultrasound to recycle nuclear graphite waste in nuclear facilities. She is currently working on a plasma-based incineration process and high power plasma torch development.

IIM NALCO Gold Medal

The **IIM NALCO Gold Medal** for 2023 is awarded to **Mr. Kausikisaran Misra**, Head-Operations (Alumina Refinery), VP, Utkal Alumina International Ltd.



Mr. Misra is Head of Operations at a state-of-the-art ~2.5 Mtpa refinery, Utkal Alumina International Limited, a 100% subsidiary of Hindalco Industries Limited. Prior to this he has

worked in multiple geographies which includes an international stint with Rio Tinto Alcan, in several capacities of technical functions. His extensive work experience covers fields of process control, design & commissioning of brownfield expansion projects, process debottlenecking, leading strategic projects on ESG & Digitalization and leading manufacturing teams – global in scale, operated by a diverse team of professionals and operatives.

IIM SAIL Gold Medal



The **IIM SAIL Gold Medal** for 2023 is awarded to **Mr. Praveen Kumar**, Manager Shape Rolling, RDCIS SAIL, as the Principal Author of the Technical Paper on “Innovations in Thermo-mechanical Processing to

Develop High Strength Steel Plates”, published in the Transactions of The Indian Institute of Metals Trans Indian Inst Met 75, 2069–2076 (2022).

As Co-Authors of the referred paper, the following individuals received Certificate of Merit. Mr. Arunava Dasgupta, Ex-CGM (Quality), ISP(IISCO), SAIL, Mr. Biswajit Sarkar, Ex-CGM RDCIS, SAIL, Prof. Kalipada Maity, Professor, Mechanical Engineering NIT, Rourkela and Mr. Sonu Kumar Gond, Manager Rourkela Steel Plant, SAIL.

IIM Best Paper on Non-Ferrous Metallurgy, TIIM Medal



The **IIM Best Paper on Non-Ferrous Metallurgy, TIIM Medal** for 2023 is awarded to **Dr. Raghvendra Tewari**, Outstanding Scientist & Associate Director, Materials Group Head, Materials Sc.

Division, Bhabha Atomic Research Centre (BARC), as the Principal Author of the Technical Paper on “Formation of the Laves Phase in Nb-Ti-Cr-Si-X-Based Alloys”.

As Co-Authors of the referred paper, the following individuals received certificate of Merit. Prof. B Vishwanadh, Assistant Professor, Department of Engineering Sciences, Homi Bhabha National Institute, Mumbai, Prof. Vijay K Vasudevan, Professor and Department Chair, Dept. of Materials Science & Engineering, University of North Texas, Denton.

IIM Distinguished Educator Award

The **IIM Distinguished Educator Award** for 2023 is awarded to **Prof. Rajib Dey**, Professor, Dept. of Metallurgical and Materials Engineering, Jadavpur University jointly with **Prof. Narendra B Dhokey**, Dept. of Metallurgy and Materials Science, College of Engineering Pune Technological University.



After passing BE in Metallurgical Engineering in 1994 and Masters in Industrial Metallurgy with gold medal, in 1996 from Jadavpur University **Prof. Rajib Dey** joined in M N Dastur and Co (P) Ltd. and

worked there in 'Cost Engineering' department till 2005. He completed PhD from Jadavpur University in 2003 and PGDFM from All India Institute of Management Studies. After that he joined in Metallurgical and Material Engineering Department of Jadavpur University as Faculty Member and became 'Professor' in 2017. He also served as Head

of the Department during 2011-13. Till now he has published 58 journal papers and 32 conference papers.



Prof. N. B. Dhokey has completed his M.Tech. from IITB and Ph.D. from VNIT Nagpur. He spent his initial six years in steel plant in Quality and Process Control department and then moved to teaching and research. He has completed sponsored projects from ISROPSC, IGCAR, UGC, DRDO, AICTE, BRNS, NRB, DST, John Deere, Industrial metal Powders and Speciality Sinter Pune. He is now Vice President of Powder Metallurgy Association of India and former Chairman of IIM Pune chapter and former National Council member of IIM. Prof. Dhokey organised several workshops for Industries in Pune, Nashik, and Aurangabad. He is now Honorary Secretary of Dr Dara P Antia memorial committee.

IIM Dr. A. K. Bose Gold Medal



The **Dr. A. K. Bose Gold Medal**, for the year 2023 is awarded to **Mr. Reddi Jaswanth Sai**, Department of Metallurgical and Materials Engg., IIT Kharagpur in recognition of his ME Thesis on “Comparative study of laser surface melting and laser surface cladding of h13 tool steel using h13 tool steel powder”.

IIM Vidya Bharathi Prize

The **Vidya Bharathi Prize** for the year 2023 is awarded jointly to **Mr. Swarnendu Das**, University of Pennsylvania, USA (PhD starting Aug 2023) & BTech from IIT BHU Varanasi (May 2023), for securing the Highest Grade in order of merit in the Final B.Tech Examination during 2022-23 Academic Session among all Indian Institutes of Technologies in India.

IIM Students' Prize

The **IIM Students' Prize** for the year 2023 is awarded to **Mr. Sourav Mohanty**, NIT Rourkela for securing the highest marks in order of merit in the final B.Tech examination during 2022-23 academic session among all National Institutes of Technology/ Indian Universities/ Engineering colleges, **Mr. Ramyanil Raha**, NIT Durgapur, securing the

second highest marks in order of merit in the final B Tech examination during 2022-23 academic session among all National Institutes of Technology / Indian Universities/ Engineering colleges, **Mr. Sohan Kr Panda**, NIT Rourkela, for securing the third highest marks in order of merit in the final B Tech examination during 2022-23 academic session among all National Institutes of Technology / Indian Universities/ Engineering colleges.

IIM Best Chapter Award

The **Best Chapter Award** Plaques are awarded to encourage Chapters for overall performance.

The following Chapters in various categories are felicitated with the IIM Best Chapter Award[s] :

Category : Large Chapters

First Prize: **IIM Kalpakkam Chapter**

Second Prize: **IIM Bhubaneswar Chapter**

Category : Medium Chapters

Winner: **IIM Chennai Chapter**

Category : Small Chapters

First Prize: **IIM Kanpur Chapter**

Second Prize: **IIM Bokaro Chapter**

Prof Brahm Prakash Memorial Quiz Award

The **Prof Brahm Prakash Memorial Quiz** is aimed to create awareness among school students and to motivate them to choose their career in Materials Science and Engineering.

2023 Award Winners :

Master R Shyam Sundar

&

Master Arjun Ananthkrishnan

PSBB Senior Secondary School, Chennai

(Nominated by IIM Chennai Chapter)

2023 Runners-Up :

Master Nissim Sahoo

&

Master Yash Pratap Singh

Delhi Public School, Angul

(Nominated by IIM Angul Chapter)

IIM Fellows

The Fellowship is conferred on members in recognition of their services to the Institute and to the Metallurgy Profession.

The 2023 Fellowship is conferred on :

Prof. Arvind Agarwal, Distinguished University Professor Chair, Mechanical and Materials Engineering Director, School of Biomedical, Materials and Mechanical Engineering (SBMME), Florida International University.

Mr. Vinay Mahashabde, Chief R&D and Product Technology, Tata Steel Ltd.

Dr. Manjini Sambandam, Vice President (Technical Services and R&D), JSW Steel Ltd., Salem Works.

Dr. Jaiteerth R Joshi, Program Director, DRDL, Hyderabad.

Dr. C.K. Asnani, Chairman & Managing Director, Uranium Corporation of India Ltd.

IIM Certificate of Honour Award



The 2023 'Certificate of Honour' (introduced in 2008) is presented to **Mr. Prem Ganesh**, former Office Bearer, IIM Jamshedpur Chapter in recognition for his commendable work in overall membership development of the Chapter, interaction with students/colleges, co-ordination with IIM Head Quarters and Office Bearers.

IIM Distinguished Contributor Award



The IIM Distinguished Contributor Award for 2023 is awarded to **Dr. Ramen Datta**, former General Manager, R&D Centre for Iron & Steel, SAIL, Ranchi and presently Consultant, SRTMI, New Delhi.

Dr. Datta has made outstanding contributions in steel research, product development, process innovations and made commendable efforts towards promotion of IIM activities over the last 40 years. Dr. Datta has contributed to IIM in different capacities. He has served as an Editor of Trans IIM during 2000-03. He served as Secretary of Ferrous Division and Joint Secretary of IIM during 2007-10.

IIM ASM Lectureship 2023

The program, established in 1979 between ASM and The Indian Institute of Metals [IIM], is intended to

promote international co-operation and provide useful service to ASM and IIM Members.

The IIM-ASM Lectureship for 2023 is conferred on



Prof. Krishanu Biswas, development of design and development of multicomponent concentrated alloys and materials, understanding the solidification Professor, Dept. of Materials Science & Engineering, IIT Kharagpur. The research work performed by him ranges from behaviour of complex concentrated alloys, novel processing of ceramic composites, understanding the alloying behaviour at nanoscale, development of bulk alloy catalysis for hydrogen energy and product prototype development.

&



Prof. Nikhil Dhawan, Associate Professor, Dept. of Metallurgical and Materials Engineering, Indian Institute of Technology, IIT-Roorkee. His research work is focused on the extraction of bases and rare earth values from red mud, fly ash, electronic waste (discarded CFLs, hard discs), lithium and cobalt from lithium-ion batteries, copper and gold values (printed circuit boards), potassium values from silicate rocks, and enrichment/hydrogen reduction of low-grade banded iron ores for steel vision 2030. He is elected a member of the Indian National Young Academy of Sciences (INAYAS).

IIM National Sustainability Awards

The Ferrous Division of the Indian Institute of Metals has been organising the National Quality Competition since 1991 to encourage and recognise Quality Assurance aspects in the Steel Sector. The award has been re-named as National Sustainability Award from 2007.

The Awards for the year 2023 are presented to:

Category I : Large Integrated Steel Plants

Joint Winners :

JSW Steel Ltd., Vidyanagar

&

Tata Steel Ltd., Jamshedpur

Category II : Secondary Steel / Alloy Steel Plants
Joint Winners :
JSW Steel Ltd, Salem Works, Salem
&
Jindal Stainless Ltd., Hisar
**Category III : DRI Plants/Pig Iron Plants/
Major Re-Rolling Units**
Winner :
Kirloskar Ferrous Industries Limited, Koppal
IIM Non-Ferrous Best Performance Awards

The Non-Ferrous Division of the Indian Institute of Metals has been organising the National Quality Competition since 2002 to encourage and recognise Quality Control aspects in the Non-ferrous sector.

The Awards for the year 2023 are presented to:

**Category I : Large Integrated Manufacturing
Plants**
Winner :
Hindustan Copper Ltd
**Category II : Secondary Processing/Fabrication
Plants of Non-Ferrous Products**
Winner :
HINDALCO Industries, Hirakud, FRP
**Category III : Units engaged in Casting and
forging of Non-Ferrous Metals
& Alloys**
Winner :
Jain Resource Recycling Pvt. Ltd.
IIM Materials Technology Start-Up Award

The IIM Materials Technology Start-Up Award was established in 2022 to commemorate the completion of the Platinum Jubilee of the Institute.

The 2023 IIM Materials Technology Start up award has been awarded to **Cellark Powertech Pvt. Ltd.** for demonstrating outstanding overall performance in the field of Metallurgical and Materials Engineering & Technology.

&

The Jury Appreciation award is conferred on **CeraTattva InnoTech (CTIT) Pvt. Ltd.**

News Updates
Domestic
Impact of CBAM on Indian steel industry

Europe has begun monitoring its imports of steel with an intention to disuade products that are an outcome of processes that result in high carbon emissions. The move is expected to hit Indian steel exporters that have been reliant on polluting coking coal as feedstock to keep their furnaces burning. While there is no immediate impact, Europe's Carbon Border Adjustment Mechanism (CBAM) has catalysed the shift towards Green Steel in India

The Economic Times (7.12.2023)

Govt asks steel makers to enhance use of artificial intelligence in plants

The government asked steelmakers to enhance the application of artificial intelligence (AI) at their respective plants, as its usage can improve the value chain and energy management, according to an official statement.

As the world looks at data-driven decision-making, the Indian steel industry needs to be at the forefront in implementing artificial intelligence technology in their operations, Union Steel Minister Jyotiraditya Scindia

said, addressing a Chintan Shivir event.

"We in the steel sector need to understand that it is our responsibility to safeguard Mother Earth by embracing the concept of green steel and the latest technologies," Scindia said.

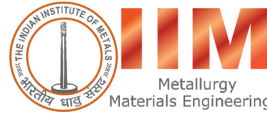
Minister of State (MoS) for Steel Faggan Singh Kulaste said the usage of AI and automation can strengthen the value chain system of the players, besides improving the energy management in the steel sector.

Business Standard (15.12.2023)

Indian steel demand boom to continue in FY24: Crisil

The Indian steel sector has enjoyed a multi-year demand surge which will continue in the current FY'24 but it is expected to moderate in the coming fiscal, global analytics company Crisil said. The sector has witnessed double digit demand growth rate of 11 to 13 per cent during three consecutive years and is likely to moderate to 3 to 5 per cent in FY'25, Miren Lodha, Director Research, Crisil Market Intelligence and Analytics said.

The Economic Times (29.12.2023)



The Indian Institute of Metals Short Professional Educational online Course on
“Performance Excellence through TQM practices”

(Course Number IIM-24-101)

7th, 8th and 9th February, 2024 09:00 hrs – 13:00 hrs each day

Background: To be world class and globally competitive, organisations have started following the best, time-tested practices, which successful global players are following. Global bench marking figures in every aspect, are becoming the goals to achieve the best of efficiency and effectiveness. Productivity improvement of men, machine and materials are achieved through improved methods of working, followed by the entire organisation. The different practices throughout the world, grouped under Japanese, European and American methodologies, focus on same aspects of waste and defect elimination, continuous improvement, and management driven customer-oriented systems approach with employee engagement. The present course gives an overview of Total Quality Management System as followed by the Japanese methodology. The course brings out the principles of Policy Deployment and Daily works management practiced through effective employee engagement with use of statistical tools.

Speaker Profile:

Course is conducted by three Senior eminent personalities, who have implemented TQM successfully in the India’s largest Special Steel long product Integrated Plant, which resulted in improved Return on Capital employed, through sustained performance improvements in production, quality, cost, delivery, safety, environment and morale. The customer-oriented TQM practices with sustained improvement over a longer period establishing the culture, has resulted in the company being awarded The Deming Prize.

1. Dr. D. Ravichandar (Ex CEO JSW Steel Salem works)
2. Mr. E. Rajendran (Ex HR Head, JSW Salem)
3. Mr. Sai RamaKrishna (Head Iron making &TQM In charge, JSW Salem)

Who should attend:

The course has advanced systemic content useful for Plant heads, Practising heads of all operating and service departments, senior management levels and middle management levels of manufacturing organisations.

Registration Fees and Payment Methods

Participant type	Online Course for 3 days.
IIM Members	5000 +900*=5900
IIM Non Member	7500+1350*= 8850
Student Member	1000+180*= 1180
Student Non-member	1500+270*=1770
*(18%GST)	

Bank Details

A/c name :

The Indian Institute of Metals

Bank : State Bank of India, SME Branch, Salt Lake,

Branch Code : 04289,

IFSC Code : SBIN0004289

Current A/c No. : 54015600024

GST : 19AAATT3359D1ZF PAN : AAATT3359D

Contact Persons

Dr G Balachandran

Chairman, SPECS Committee,

The Indian Institute of Metals

iimshortonlinecourses@gmail.com

Ms Atashi Saha

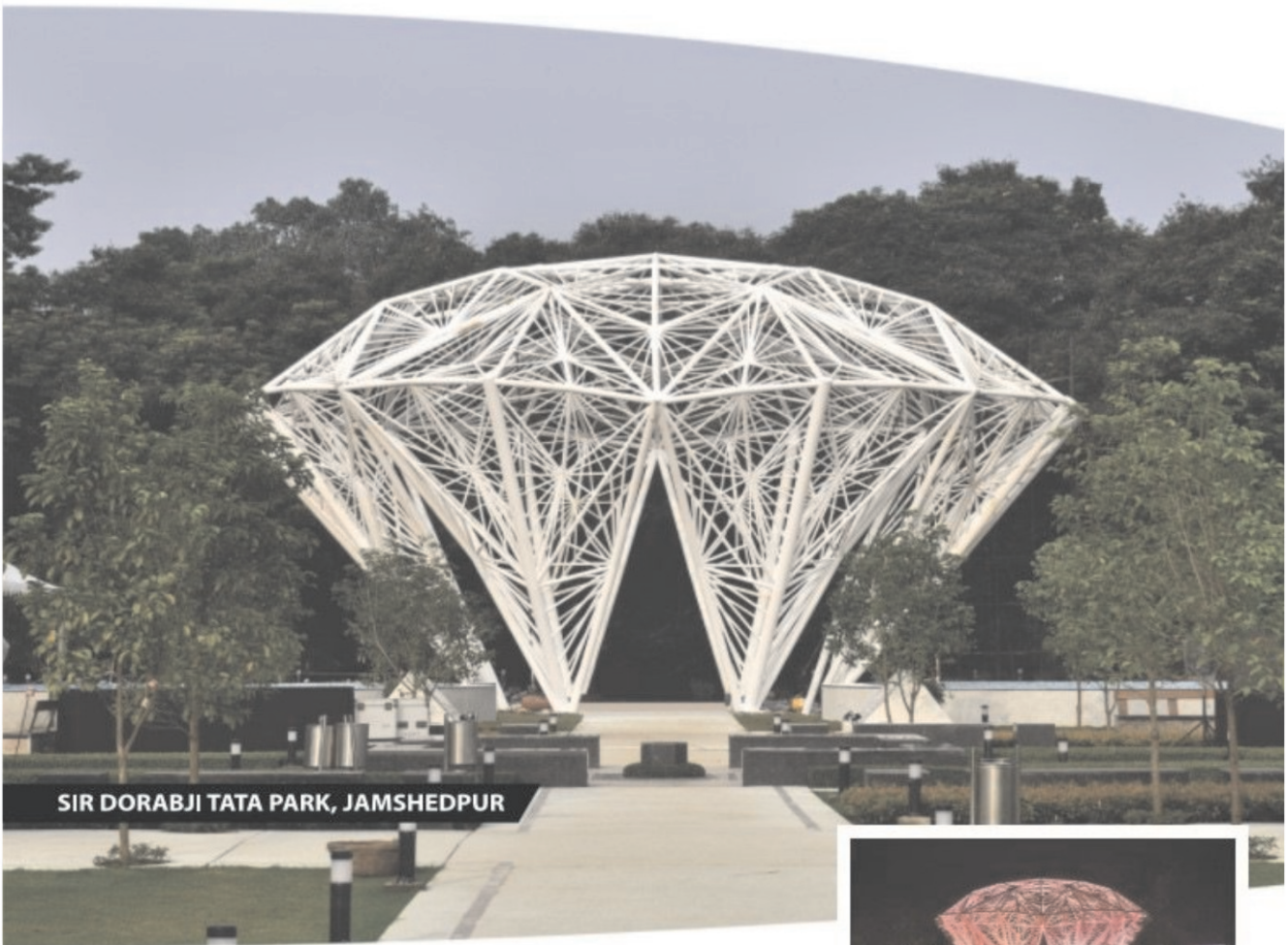
Deputy General Manager

The Indian Institute of Metals

Plot 13/4, Block AQ, Salt Lake, Sec V,

Kolkata: 700 091

atashi.sahaiiom@gmail.com



A JEWEL CRAFTED IN STEEL, BUILT FOR TOMORROW

The Jubilee Diamond sculpture is fabricated from 45MT of Tata Structura steel hollow sections. The superior strength-to-weight ratio of Tata Structura makes it flexible enough to craft imaginative designs in steel - a material of choice for architects who shape tomorrow. The open plan architecture of this stunning monument allows visitors an

immersive experience. The sculpture celebrates the contribution of Sir Dorabji Tata and his wife Lady Meherbai Tata to the Company in the 1920s. Sure, we make steel.

But **#WeAlsoMakeTomorrow**.

Building today's monuments for a more beautiful tomorrow

Jubilee Diamond, Jamshedpur



Glimpses



Faggan S Kulaste, Hon. Minister of St. for Steel & Rural Dev., Gol



Satish Pai, President of IIM



Sajjan Jindal, Vice President of IIM



Cultural Program



IIM Non-Ferrous Best Performance Awards



IIM Book Launch @KIIT University



Brig Arun Ganguli (Retd) Secretary General of IIM



IIM Materials Technology Start-Up Awards



IIM National Sustainability Awards



IIM Best Chapters Awards



Cultural Program



Valedictory Ceremony

NMA'22 & IIM-ATM'23