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IIM METAL NEWS

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IIM METAL NEWS

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Prof K Bhanu Sankara Rao

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IIM President in the News — Mr. Satish Pai, MD, Hindalco Industries

The Managing Director of Hindalco Industries Ltd. **Mr. Satish Pai** was conferred the Honorary Doctorate degree by Hon'ble President of India, Smt. Droupadi Murmu at the 53rd Convocation of Utkal University on February 29, 2024.

The D. Litt. in Commerce and Management Studies was presented to him for his outstanding contribution in the growth of metal industry and for the sustainability and transformation of the industry. Among others, Hon'ble Governor Raghubar Das, Minister for Higher Education, Atanu Sabyasachi Nayak and Vice-Chancellor of Utkal University, Prof. Sabita Acharya were present during the award ceremony.

Mr. Satish Pai is the MD of Aditya Birla Group's flagship metal company Hindalco, since 2016, and he has been instrumental in bringing lot of innovations and growth in metal industry. In Odisha, Hindalco has a strong presence with many operational industries and investments of over Rs. 25,000 crores during the last 15 years. Mr. Satish Pai took over as the President of The Indian Institute of Metals on August 1st, 2023.

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Technical Article

Weldability assessment of boron free and boron added austenitic consumables used for joining 304B4 stainless steel

M Divya[a], C R Das[a,b] and S K Albert[c]

Abstract

304B4 SS is an austenitic stainless steel used for neutron shielding applications that contains ~1.3 wt.% of boron in the form of Cr_2B borides distributed in the matrix. Though weldability of this steel is reported to be good, welding using standard E309 electrode during fabrication of components revealed high cracking in the weldment. In order to overcome the cracking issue due to the base metal dilution, a non-standard boron added consumable-E308BRN was used. In absence of non-standard consumable, E309 SS can be used to weld E304B4 SS and accordingly, welding procedure need to be modified. The hot cracking susceptibility of the weld joints prepared by modified welding procedure using E309 SS and that of direct joint made using E308BRN were evaluated. Spot varestraint tests carried out on these specimens showed very low cracking susceptibility for E308BRN weld metal and E309 weld metal with modified procedure.

1.0 Introduction :

Borated stainless steels are austenitic stainless steels (SS). These steels contain 0.2 to 2 wt.% boron dispersed in the form of chromium borides (Cr_2B) in the matrix. According to ASTM specification A887, these steels are classified in 8 categories according to its boron content (AISI 304B to 304B7) [1]. These steels find wide applications in the nuclear industry for construction of nuclear fuel transportation casks, spent fuel storage racks, absorber rods for nuclear criticality control and neutron shields for structural components. This is because natural boron contains ~18 % of B10 isotope which is an effective neutron absorber as its absorption cross section is ~ 3800 barns [2].

AISI 304B4 stainless steel containing ~1.3 wt.% boron is reported to be weldable under moderate restraint forces [3]. Standard E309/E308 electrodes, which are commonly used to weld dissimilar metals and their weld metal is susceptible to hot cracking are recommended for welding of 304B4 SS [4]. However, for construction of neutron shields for Intermediate Heat Exchangers (IHX) of PFBR (Prototype Fast Breeder Reactor), several welding trials were taken-up using these consumables and more than 100 test coupons were fabricated which revealed cracking in the weld metals [5]. Boron containing non-standard consumable (E308BRN), which is commercially available was found to produce sound weld joint and the same was used to fabricate 304B4 SS shell with dished end weld joint successfully [5].

Reason for cracking of weld metal of 304B4 SS weld joint while welding using E309/E308 consumable is "hot cracking". The cause of hot cracking in these weld joints is not due to the presence of impurities like sulphur or phosphorus as in case of regular stainless steels such as 304 or 316, but it is boron which is introduced in the weld metal due to melting of base metal during welding causing dilution. Base metal dilution in 308/309 weld metal will lead to ingress of B in the weld metal ranging from 1 to less than 0.2 wt.% from the fusion line to near weld centre respectively. In this B ingress region of weld metal where boron content varies from 0.2 to 0.5 wt.%, the risk of hot cracking pronounces due to

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the presence of thin films of eutectic borides along the interdendritic regions [6]. This insufficient volume fraction of eutectic phase in this region of weld metal unable to back fill the cracks during solidification. Above 0.5 wt.% B, the volume fraction of eutectic constituents is sufficient to back fill the cracks and prevent solidification cracking during welding [3]. The objective of the present study is to compare the hot cracking susceptibilities of 304B4 SS weld joint prepared directly using E308BRN and buttered E309 weld metal. Welding procedure for welding of this steel using E309 SS is modified to prevent hot cracking during welding so that this standard electrode can be used for welding 304B4 SS in case necessity arises due to non-availability of this consumable in the market.

2.0 Experimental

AISI 304B4 SS (0.02C-18.05Cr-12.29Ni-1.24B) plates of 10 mm thickness was used for fabrication of weld joints using E309 and E308BRN electrodes by Shielded Metal Arc welding (SMAW) process.

2.1 Welding procedure used for joining 304B4 SS using E309 and E308BRN consumables

In the modified welding procedure adopted for 304B4 SS using E309, at first, the edges to be joined were buttered using E309 welding consumable. Thickness of the buttered layer is sufficient so that final welding is made between 309 to 309 SS weld metal and boron dilution become zero The welding parameters, current- 120 A and voltage - 25 V were used during the buttering process. Residual stress evolution during buttering is minimum as edges are free from any restraint. In this stage, risk of cracking would be considerably less despite susceptible weld metal microstructure (i.e) presence of low melting eutectic network in the interdendritc regions. Weld joint was made in 1G position using 309 electrode (4 mm φ) with 125 A current/ 25 V. Welding speed was maintained at 1.6 mm/s during welding. 304B4 SS weld joint using E308BRN consumable was prepared by direct joining without any buttering. The welding parameters were 110 A current/ 20-25 V, welding speed was maintained at 1.6 mm/s during welding in 1G position.

2.2 Varestraint Test

Varestraint test specimens (Fig.1.) were prepared from the fabricated weld pad. The interface between the buttered layer and weld metal is placed at the center of the specimen. Spot varestraint test was carried using varestraint test set up by producing a stationary weld pool at the center of the specimen so that HAZ is created around the buttered region - weld interface. The spot varestraint tests were conducted at different augmented strains as per procedure described in the literature [6]. The tested specimens were immediately pickled to remove the surface oxide layer Crack length measurements were carried out using a stereo microscope. From the measured crack lengths, Maximum and Total Crack lengths were determined for specimens subjected to various augmented strain levels.

Selected specimens after spot Varestraint tests were sectioned and prepared by grinding and polishing up to 1 µm surface finish metallographically. The specimens were electrolytically etched using 10 % oxalic acid solution at 3 V DC for 10 seconds. The etched specimens were observed under Zeiss make light optical microscope.

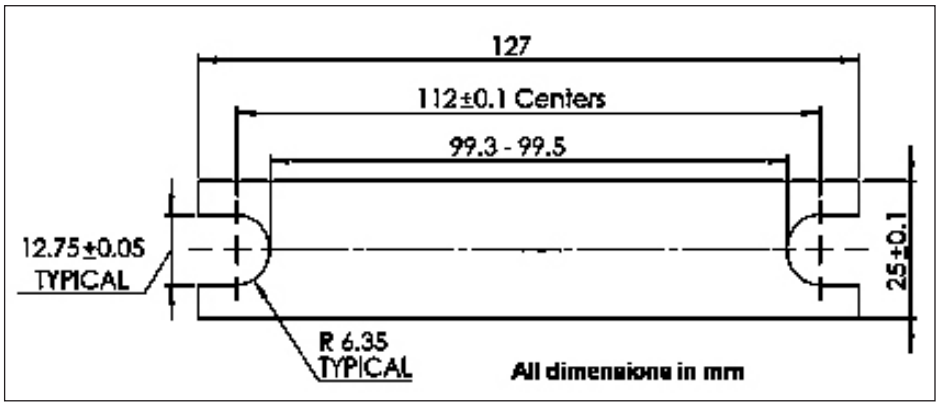

Fig.1 : Schematic of a varestraint test specimen

3.0 Results

3.1 Microstructure of 309 - 304B4 SS weld joint prepared after buttering

Figure 2 shows the macrostructure of 304B4SS weld joint (prepared using modified welding procedure) and the microstructures of individual zones in the weld joint. From the Fig.2(a), it is evident that there are two interfaces in the weld joint, (i) an interface between 304B4 SS base metal and 309 buttered layer and (ii) an interface between the 309 buttered layer and 309 weld metal. Figure 2(b) shows the microstructure of PMZ formed in 304B4 SS base metal which consists of partially molten and solidified austenite (γ) grains and completely molten and solidified eutectic phases. Figure 2(c) shows the microstructure of unmixed zone (UMZ) formed next to PMZ which consists of dendritic - γ and inter-dendritic eutectic. In Fig.2(d), the region of 309SS butter layer close to the interface-1 in which substantial base metal dilution has occurred as shown. The microstructure consists of γ phase and a mixture of eutectic phase and δ ferrite in the inter-dendritic region as shown in the figure. The microstructure in Fig.2(e) shows the butter region far away from the interface -1 which contains γ dendrites and δ ferrite. The microstructure in Fig.2(f) shows the interface between the 309SS butter layer and the weld metal. This microstructure consists of high fraction of δ ferrite. The microstructure of 309SS weld metal deposited after buttering (Fig.2(g)) shows only γ dendrites and δ ferrite.

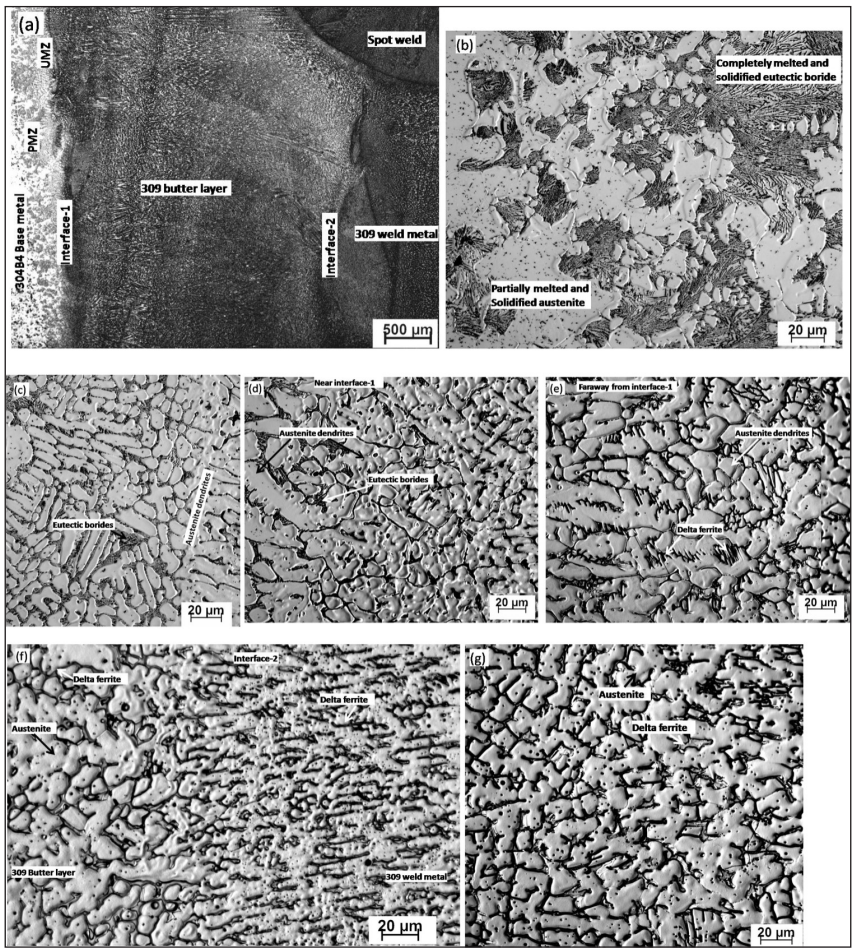

Fig.2 : (a) Macrostructure of 304B4 SS weld joint prepared using modified welding procedure (b) Microstructure of PMZ formed in 304B4 SS base metal (c) Microstructure of UMZ formed next to PMZ Microstructures of 309SS butter layer (d) near (e) far away from 304B4 SS base metal – 309SS butter layer interface (interface -1) (f) Microstructure of interface between 309SS butter layer and 309 weld metal (interface-2) (g) Microstructure of 309SS weld metal [7].

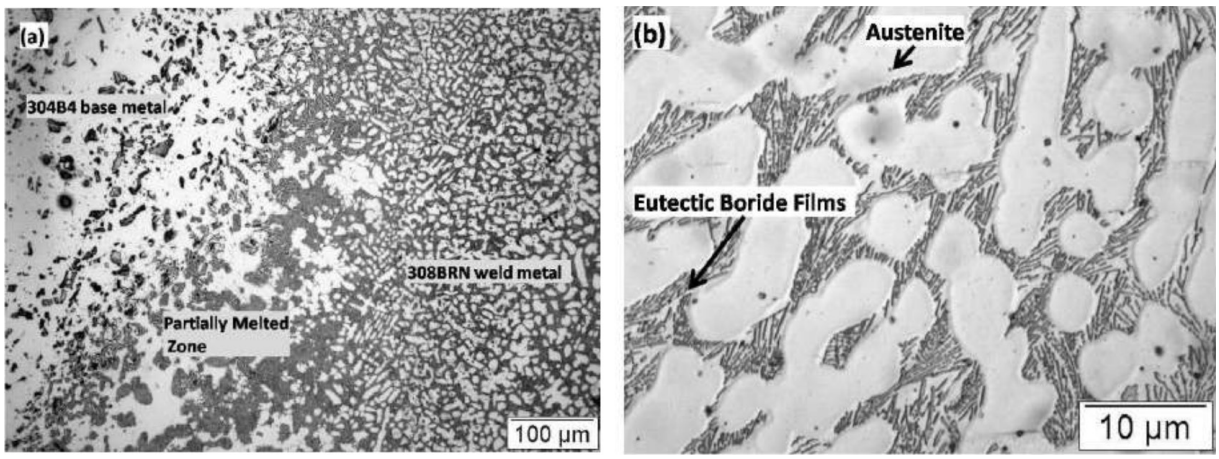

Fig.3 : (a) Microstructure of 308BRN SS weldment at low magnification and (b) high magnification image of 308BRN SS weld metal microstructure

E308BRN weld metal microstructure consists of primary austenite dendrites with inter-dendritic austenite/boride eutectic constituents. The volume fraction of the eutectic phases obtained after analysing the microstructure using *Image J* software is ~0.32 ± 0.02. The value reported is an average of readings taken from 10 images obtained from different locations of the weld metal. No variation in the microstructure across the weld metal is observed.

3.2 Hot cracking susceptibility

Figure.4 shows the macrostructures of spot varestraint tested specimens prepared from E308BRN SS and E309 SS weld metal. From the micrographs it is evident that the E308BRN SS weld metal shows negligible cracking as compared to E309 SS weld metal. Therefore, it can be stated that under moderate restraint forces, E308BRN SS weld metal has better weldability compared to that of E309 SS weld metal.

In Fig.5, plots of Maximum Crack Length (MCL) vs % augmented strain obtained from weld joints prepared using 309 electrode with and without buttering (taken from earlier studies [6]) is shown. The MCL at threshold strain (1 %) is 0.5 mm for the weld joint prepared using buttered layer whereas the same is ~ 2.5 mm for the weld joint prepared using without buttering as shown in the figure. The crack length measurements taken on the specimens (Fig.5) reveal that the weld joint prepared after sufficient buttering the edges has lower susceptibility to hot cracking compared that of the direct joint. It may be noted that there were no visible open cracks were seen on the surface of E308BRN weld metal after spot varestraint test. Hence, crack length measurements were not carried out.

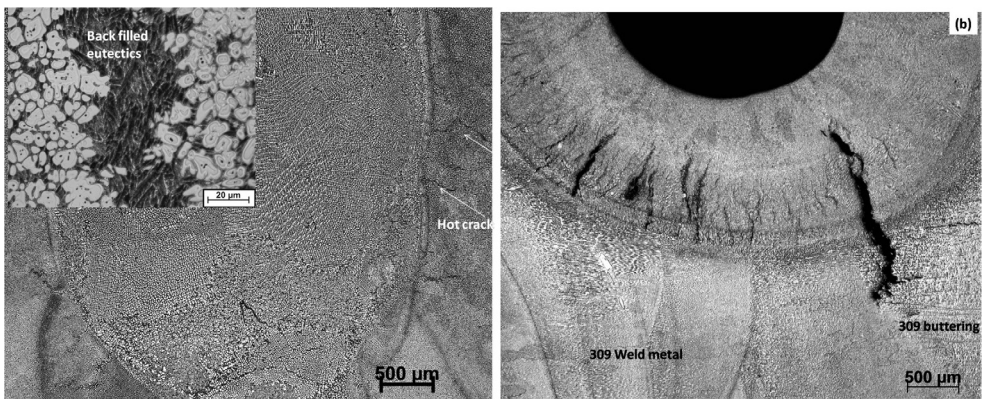

Fig.4 : Macrostructures of spot varestraint tested specimens (a) 308BRN (b) E 309 SS weld metals.

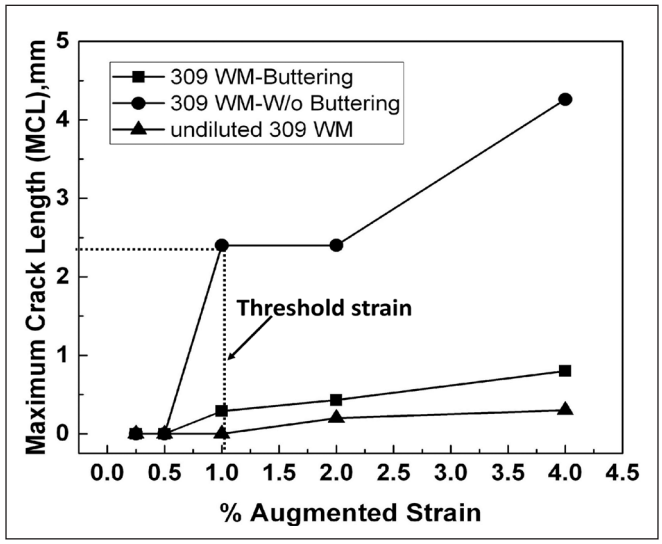

Fig.5 : Comparison of cracking susceptibilities of SS 304B4 weld joints prepared using E309 with and without buttering and undiluted 309 weld metal.

4.0 Discussion

The mechanism of hot cracking occurring while using boron free welding consumables like E309 is clearly understood from our earlier studies [6]. It is to be noted that part of the fusion zone of 304B4 SS weld metal made using E309 welding consumable influenced by the base metal dilution and weld metal containing~ 0.2-0.48 wt.% of boron is highly susceptible to hot cracking during multipass welding. High cracking susceptibility of this part of the fusion zone is attributed to synergistic effect of large freezing range and insufficient volume fraction of eutectic borides to aid back filling of solidification cracks. Presence of lower volume fraction of eutectic boride phase due to base metal dilution in the weld metal is the primary cause for hot cracking in the direct weld joints of 304 B4 SS using E309 SS consumable

Based on this understanding obtained from the previous studies [6], buttering of edges of base metal is proposed. The idea behind this welding procedure is that the risk of hot cracking can be minimize if a susceptible microstructure can be avoided during actual welding, when residual stresses generated can facilitate cracking. Results indeed confirm this hypothesis. The microstructure of the zone that is likely to be crack prone (butter layer and the weld metal interfacial area) in the E309 SS buttered weld joint is almost free of borides in the microstructure (Fig.2) and its cracking susceptibility is considerably lower than that obtained in base metal - weld metal interface of the direct joint between 304B4SS plates using E309 SS consumable from reference [6]. This is shown in Fig 5, a comparison of MCL data obtained for the spot Varestraint test conducted for the two zones as mentioned above in the weld joints prepared with and without buttering along with that of the undiluted weld metal. Liquation cracking susceptibility of weld joint prepared after buttering the edges is far lower than the other.

On the other hand, E308BRN SS weld metal consists of austenite dendrites and a continuous network of interdendritic austenite /boride eutectic constituents as shown in Fig.3. In this weld joint, boron content of the weld metal is only marginally lower than that of base metal and hence, there is little scope altering the boron content in the weld metal due to effect of dilution by base metal. Therefore, a uniform microstructure could be observed from the weld interface to the center of the weld metal. The area fraction of eutectic phase in the weld metal is estimated by Image J is around 0.32 which is uniformly distributed. From the spot varestraint test results, it is observed that there is no significant cracking in these specimens in the weld metal HAZ (Fig.4(a)). Hence, it can be stated that 308BRN SS weld metal is considerably resistant to weld metal liquation cracking. It is reported that backfilling of the cracks by eutectic liquid takes place

by the phenomenon of capillary action [8]. Thus, the backfilling mechanism follows flow of liquid in the crack, assisted by capillary action is a function of liquid density/viscosity, column radius/length and surface energy [9]. From the results it can be inferred that in case of near eutectic alloys, where the fraction of eutectic liquid formed is as high as 0.3, hot cracking is likely to occur when high restraints are imposed during welding. At low to moderate restraint levels, solidification cracks formed in the welds are healed by backfilling of eutectic liquid.

5.0 Summary

1. Buttering of the joint surface with E309 SS for sufficient thickness is recommended as an alternate procedure to join borated stainless steel to bring down the risk of hot cracking in case matching consumable is not available in the market
2. Thickness of the buttered layer should be such that after edge preparation for subsequent welding, the surfaces to be welded together should be free of dilution.
3. Boron content of 308BRN SS weld metal is only marginally lower than that of 304B4 SS base metal and hence, the solidification range estimated for 308BRN weld is more or less similar to that of the base metal. Also, the eutectic borides formed in 308BRN SS weld metal aids in backfilling of solidification cracks thus mitigating the cracking when there are moderate restraint acting on the weld joint.

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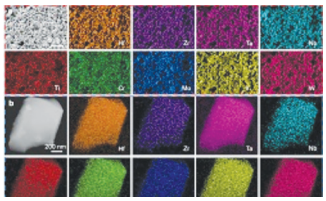
Recent Developments International

Chinese scientists develop ultrastrong, high thermal insulating ceramics



Scientists at the South China University of Technology have created a new porous ceramic that is ultrastrong at elevated temperatures and simultaneously high thermal insulating, two properties needed for making the shell of hypersonic aircraft.

The team developed porous high-entropy diboride ceramics exhibiting remarkable load-carrying capability, high thermal insulating performance, and superior thermal stability of up to 2,000 degrees Celsius.

Such properties have made it an attractive option for reliable thermal insulation under extreme conditions, according to the university.

Searching for a porous ceramic that is both strong and resistant to extreme heat has been a holy grail for material scientists with the advent of hypersonic flight technologies. The two features, however, are difficult to achieve simultaneously in conventional porous ceramics, whose previous record of maximum temperature stood at 1,500 degrees Celsius.

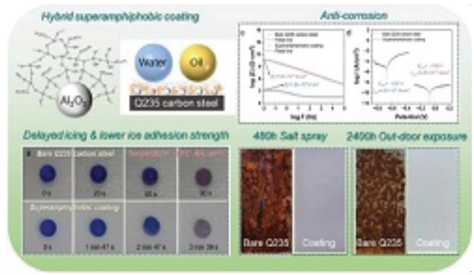
Researchers said the new material has broad application prospects in the aerospace, energy, and chemical industries.

Source: ASM International

Researchers develop hybrid superamphiphobic anti-corrosion and anti-icing coating

A research team from the Institute of Oceanology of the Chinese Academy of Sciences developed an organic–inorganic hybrid superamphiphobic coating with integrated functionalities of liquid repellency, self-cleaning, anti-corrosion, and anti-icing.

Corrosion and failure of metal materials has been a problem that researchers and engineers are eager to solve. Inspired by the lotus effect, biomimetic



superhydrophobic materials with typical non-wetting properties at the interface have shown great potential in the field of corrosion protection.

Although the anti-corrosion function of superhydrophobic materials has been confirmed by researchers at home and abroad, there are still many unresolved challenges in the process of transitioning from the laboratory to practical applications.

According to the researchers of the study published in the Journal of Materials Science & Technology, the developed coating exhibits both superhydrophobic and superoleophobic properties and shows excellent repellency to low surface tension liquids such as water, glycerol, ethylene glycol, and peanut oil, with sliding angles all less than 7°.

The corrosion resistance of the coatings was extensively evaluated using electrochemical impedance spectroscopy, Tafel polarization, salt spray testing, and outdoor atmospheric exposure, respectively. The results showed that the charge transfer resistance and low-frequency modulus of the coating increased by 7–8 orders of magnitude, enduring 480 hours of neutral salt spray and 2,400 hours of atmospheric exposure, demonstrating significant long-term anti-corrosion potential.

In addition to significantly improved corrosion resistance, the coatings also demonstrated their functional integration capabilities in self-cleaning, delayed icing, lossless liquid transport, and substrate applicability.

The uniform dispersion of functionalized Al_2O_3 nanoparticles in the coatings provides important assurance for the ultimate realization of the coatings' multifunctional integration properties.

Source: ASM International

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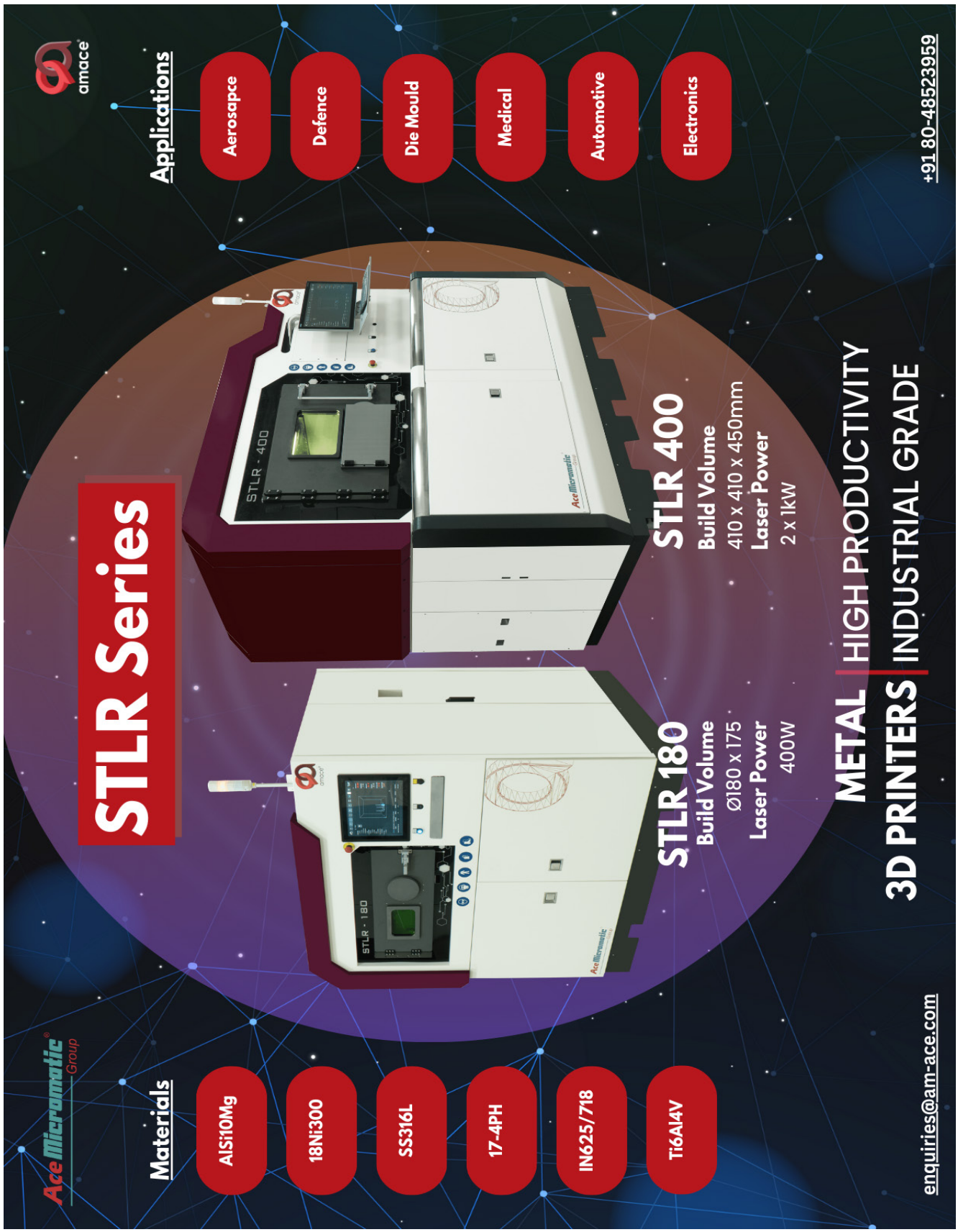
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Foundation Day of IIM HO & Across Chapters

Head Office

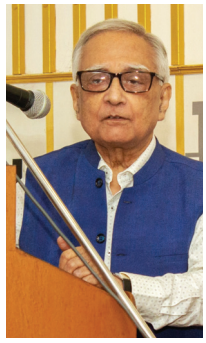
The 78th Foundation Day was celebrated at the office premises of IIM Head quarter on February 24, 2024.

The celebration commenced with the welcome speech of Brig Arun Ganguli (Retd), Secretary General, IIM who extended a warm welcome to all delegates, members, and employees present. He expressed gratitude to Former Presidents, Apex, Council Members, Chapter Office Bearers, Committee & Sub-Committee Members and the entire fraternity highlighting IIM's ability to cater to Industry, Academia & Research Organisations simultaneously. The growth of IIM from 42 members to over 8,000 individuals in 77+ years is a testament to its success, with 48 Regular and 46 Student Affiliate Chapters serving as key components of its foundation.

This was followed by the lamp-lighting ceremony in the presence of all delegates, and the welcome song in the voice of Ms. Nabatara Mitra, IIM HO accompanied by her musicians.

After that the video message received from Shri Satish Pai, President, IIM and from Dr. Komal Kapoor, Vice President (NF division), IIM were played as they could not join physically due to some unforeseen circumstances. A documentary video on the "Journey of IIM since Inception" was also played. After that Ms. Nabatara Mitra performed few melodious songs one more time. She was presented a small token of appreciation as a gesture from IIM.

Soon after this, the emcee Mr. Tamal Goswami invited all the dignitaries to the dais to share few words during this auspicious day. Prof. Uday Kumar Chatterjee, former Managing Editor of IIM Metal News, Mr. Bhaskar Roy, Chairman of AFRC, Dr. Shantanu Ray, former Managing Editor of IIM Metal News, Dr. Asim Ray, former Chairman of IIM Kolkata Chapter, Dr. Sukomal Ghosh, former Managing Editor of IIM Metal News, Mr. Sudip Kumar Basak, Chairman IIM Kolkata Chapter delivered inspiring speeches that highlighted the glorious past of the Institute. They took us through their reminiscences on IIM's journey so far, and also suggested the way forward, keeping our Institute's flag soaring high.



This was followed by the cake cutting ceremony. The event was concluded with a vote of thanks delivered by Dr. D De Sarkar, Co-Chairman, AFRC Committee.

Bhubaneswar Chapter

To commemorate the 78th foundation of the Indian Institute of Metals (IIM) on 24th February 2024, an Invited talk was being organised jointly by IIM Bhubaneswar Chapter and CSIR-IMMT on 23-02-2024 at 4:00 PM in the S S Bhatnagar Hall at CSIR-IMMT, Bhubaneswar. The speaker Dr. Shubhendu Pattnaik, former Deputy Director Pathani Samanta Planetarium, Bhubaneshwar, Science and Technology Department Govt. of Odisha presented the popular talk on Chandrayaan: A crusade to Enhance Scientific temper. Theevent was steered by Dr. Ajit Panigrahi, Secretary, IIM Bhubaneswar chapter. The welcome address was delivered by Dr. A.K. Chaubey, Chairman, IIM Bhubaneswar chapter. The introductory remarks to gathering was given by Shri H.K. Tripathy, Council member, IIM and Former chairman, IIM Bhubaneswar chapter. After that, Dr. D.S. Rao, Vice chairman of IIM Bhubaneswar chapter narrated accolades of the speaker andwelcomed him for the talk. Dr. Pattnaik briefed about the chandrayan, its technicality, and cleared the mythsdeveloped around it. About 70 participants attended the talk.

Glimpses of the event

Lamp lighting by the Chief Guest

Welcome address by the Chapter Chairman

Felicitation of Chief Guest Dr. Shubhendu Pattnaik

All the participants

Bokaro Chapter

Members of the IIM Bokaro Chapter celebrated the 78th Foundation Day of Indian Institute of Metals on 24.02.2024. The program was inaugurated by lighting of the lamp. Shri Santosh Kumar, Jt. Secretary, IIM Bokaro Chapter delivered the welcome address and informed about the present and future activities of IIM Bokaro Chapter. Shri Manohar Lal, Vice-chairman, IIM Bokaro Chapter suggested for preliminary work-out of the conference proposed to be held in the month of Sep'24/Oct'24 at Bokaro Steel City. Shri Rajeev Dhawan, Vice-chairman, IIM Bokaro Chapter shared the thoughts & roadmap ahead for increasing the activities of The Indian Institute of Metals, Bokaro chapter.

The meeting concluded with the vote of thanks proposed by Smt. B Sunita Minz, Treasurer, IIM Bokaro Chapter.

Vijayanagar chapter

IIM Vijayanagar chapter celebrated the IIM Foundation Day on 24th February with a cake cutting and briefing on the role of IIM played in the metal industry in India since its Inception. The secretary of the chapter Mr. L R Singh conducted the Executive Committee meeting and reviewed the chapter activities. He also emphasised on increased participation and events in the coming year. He also reviewed the Preparation of IIM ATM 2024 and nominated office bearers for various committees in organising the IIM ATM 2024 at Bangalore.

Glimpses of the event

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Recent Advances in Materials & Manufacturing Processes (RAMMP) - 2024

The Conference on Recent Advances in Materials & Manufacturing Processes held at Mahatma Gandhi Institute of Technology (MGIT) on 13th February 2024, orchestrated a convergence of over 100 students and research scholars from prestigious institutions like MGIT, IIT Hyderabad, and University of Hyderabad. The program was convened by Dr. Mayur Vaidya (IIT Hyderabad) and co-convened by Dr. P V S Lakshminarayana (MGIT) and Dr. K. Guruvidyathri (University of Hyderabad) with advice from various eminent people including Prof. Bhanu Sankara Rao.

The scope of the symposium was at exploring the cutting-edge developments in materials research and manufacturing techniques, unravelling the intricacies of exotic materials, and the processes driving their synthesis. Eminent speakers, totalling 20 in number, presented their groundbreaking research work, covering a diverse range of topics spanning from alloy design to additive manufacturing, advanced steels to nanomaterials, and beyond. A detailed list of speakers and their topics is given in table 1.

The talks delved into various dimensions of materials science and engineering, kindling young minds on the joy of experimenting in materials & manufacturing processes. The applications of materials range from nuclear to aerospace. Noteworthy discussions included the atomic characterization of boride-ferrite composites, advancements in friction stir welding, and the application of Integrated Computational Materials Engineering (ICME) for accelerated materials design.

Key areas of focus included alloy design, advanced manufacturing methods, characterization techniques, and the exploration of emerging materials like high entropy alloys and nanocarbons. Moreover, the conference provided a platform for scholars to discuss the challenges and opportunities in fields ranging from metallurgy to aerospace and mechanical engineering.

The event underscored the vital collaboration between academia, research labs and industry in driving innovation and technological advancement. Through insightful presentations and fruitful discussions, the conference aimed to not only assess current progress but also to chart a course for future developments in the dynamic realm of materials science and manufacturing.

With the support of sponsors including VNC Steel Distributors, JEOL, and Innomet Powders, this event facilitated a dynamic exchange of ideas and insights into the forefront of materials science and manufacturing. In essence, the Conference on Recent Advances in Materials & Manufacturing Processes served as a catalyst for fostering interdisciplinary collaboration, inspiring new avenues of research, and propelling the frontier of materials science towards further heights.

List of speakers who delivered a talk at RAMMP 2024 :

Name of the speaker	Designation	Topic of the talk
Dr. B.S. Murty	IIT Hyderabad	The joy of experimenting
Dr. Komal Kapoor	NFC Hyderabad	Advanced Materials & Processing in Nuclear Applications
Dr. Tata Narasinga Rao	ARCI Hyderabad	Materials and Processes in Emerging Energy technologies
Dr. T Muthukumar	Midhani Hyderabad	Materials for Aerospace applications

Dr. Arup Dasgupta	IGCAR Kalpakkam	Development and atomic characterization of boride-ferrite composite for spent fuel-storage application
Dr. K V Rajulapati	University of Hyderabad	A product development journey for light-weighting applications in automotive sector
Dr. M Vijalakshmi	MGIT Hyderabad	Recent Advances in Friction Stir Welding of Ferritic-Martensitic Steels
Dr. Chinmoy Chattapadhyay	NIFFT Ranchi	Kinetics - an efficient guide of phase prediction in High Entropy Alloys
Dr. K G Pradeep	IIT Madras	Combinatorial alloy design: Rejuvenating the concept of alloy design
Dr. N Narsaiah	NIT Warangal	Creep Fatigue Crack Growth (CFCG) Behaviour of P91 Steel used for power plant applications
Dr. VVSS Srikanth	University of Hyderabad	Advances in kg-scale Processing of Nanocarbons
Dr. R. Sankarasubramanian	DMRL Hyderabad	Integrated Computational Materials Engineering - An Overview
Dr. Saswata Bhattacharya	IIT Hyderabad	Applications of ICME for accelerated materials design
Dr. Pratik K Ray	IIT Ropar	Physical insights from Materials Informatics: a generalized analysis framework
Dr. V. S. Sarma	IIT Madras	Development of high strength-high ductility medium Mn advanced high strength steel through CALPHAD-based alloy design and thermomechanical processing
Dr. Satyam Suwas	IISC Bangalore	Microstructural features of specially processed metals and alloys
Dr. V. Anil Kumar	VSSC Trivandrum	Metal Additive Manufacturing for Aerospace Applications
Dr. Bharat B. Panigrahi	IIT Hyderabad	Microstructure Evolution on Additively Manufactured Inconel Superalloys
Dr. Ajeet Srivastava	VNIT Nagpur	Designing tungsten oxide nanostructures
Dr. Joydip Joardar	ARCI Hyderabad	Ultrafine Cr2AlC MAX phase based composites: Microstructure and deformation behavior

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Chapter Activities — Hazira, Mumbai, Kalpakkam

Hazira Chapter

IIM Hazira Chapter conducted a membership drive in Surat's Dr. S and S.S. Gandhy College of Engineering and Technology on 12th Dec 2023.

During the event, IIM Hazira Chapter Chairman, Mr. R Raj Kumar and Vice Chairman, Dr. V Kalyankar, Dr. Bindu Goyal (HOD Metallurgy, SS Gandhy College) motivated the young students & Faculty members to become members of IIM Hazira chapter.

The event was attended by more than 40 students and faculty members.

Mumbai Chapter

On 2nd February, 2024, IIM Mumbai Chapter organised an evening lecture as part of its evening lecture series. The event was held at the Training School Hostel's multipurpose hall in Anushaktinagar, Mumbai, and was attended by over 100 people in person.

The evening started with the welcome address by Prof R. Tewari, Vice-Chairman IIM Mumbai Chapter & AD, Materials Group BARC to all the guests and members. Subsequently, Dr. D. K. Singh Secretary, IIM Mumbai Chapter, introduced Prof. D.K. Aswal, Director of HS & EG at BARC and invited speaker of the evening, to the audience.

Glimpses of the evening lecture

The Participants

Dr. Dinesh K Aswal delivering the lecture

Dr. Dinesh K Aswal delivered a comprehensive lecture, sharing his expertise on the intricate relationship between radiation, nuclear energy and the environment. His insights shed light on the current challenges and opportunities in this dynamic field. Following Dr. Aswal's enlightening lecture, an interactive session was conducted, allowing attendees to engage with Dr. Aswal directly. Participants seized the opportunity to pose thought-provoking questions, fostering meaningful discussions and insights.

Dr. Aswal and other distinguished guests were honored with tokens of appreciation as a gesture of gratitude for their valuable contributions to the event.

Kalpakkam Chapter

1) The Indian Institute of Metals, Kalpakkam Chapter organised a half-day theme meeting for Scientists/ Engineers and Scholars on **"Failure modes in SFRs and Design Methodologies"** at IGCAR, Kalpakkam on 3rd January 2024. In total, three talks were presented by the senior scientists of IGCAR. The theme Meeting, of significant relevance to sodium cooled fast reactors, is aimed to provide information on the failure modes of various components in SFRs and the design methodologies adopted to mitigate such failures, and to enrich the knowledge base of young officers and PhD students working in the above area. The programme was designed to cover a broad range of topics in the field of failure modes and design strategies adopted for components.

Dr. M. Vasudevan, Chairman IIM Kalpakkam Chapter& Associate Director, MDTG gave opening remarks for the programme and a brief address to the participants. The technical event started with the presentation from **Shri. S.D. Sajish, Head, SDS, RDTG** on "Structural mechanics related failures modes in sodium cooled fast reactors". **Shri. D. Naga Sivayya, Head, CES, RDTG** presented the work on "Design and Performance Analysis of Fast Reactor Core Components". The final talk was from **Dr. U. Parthasarathy, Head, SHTD, RDTG** on "Failure modes in SFRs and Design methodologies".

All the talks were informative, and the Research scholars and Young scientists have interacted with all the speakers scientifically. Around 52 members have attended the lectures. Dr. M. Vasudevan, Chairman IIM Kalpakkam Chapter presented Mementoes to all the speakers. He motivated the participants in taking up the challenging tasks and sharing their experience with their younger colleagues and students. Dr. G.V. Prasad Reddy, Convener FMDM-2024proposed vote of thanks and thanked the Speakers for sharing their knowledge and expertise. The event was received well within the research community and IIM members across various groups of IGCAR.

2) The Indian Institute of Metals, Kalpakkam Chapter organised a Special Lecture on **"Transformative Evolution: Innovations in Railway Rolling Stock Technology in India"** by Shri. Debi Prasad Dash, Former General Manager, Chittaranjan Locomotive Works (Rtd) and from Indian Railway Service of Electrical Engineers (Rtd). The lecture was held on January 11, 2024 at IGCAR, Kalpakkam.

The lecture delved into the dynamic landscape

of railway rolling stock technology, tracing its evolutionary journey from the traditional ICF design coaches(1955) to the advanced LHB coaches in 2000 & Vandebharat express (2018) and explored the paradigm shift from steam engines to electric locomotives. He emphasized the crucial role of technological upgrades in enhancing the efficiency, sustainability, and safety of railway system in India. The historical transition from Integral Coach Factory (ICF) design coaches to Linke Hofmann Busch (LHB) coaches signified a landmark moment in railway rolling stock evolution. The speaker presented the technical advancements that underpin this shift, focusing on how Vandebharat coaches represent a leap forward in passenger safety, comfort, and operational performance.

Moving beyond conventional locomotive technology, he presented the technological upgrade in Electric Multiple Units (EMUs). By scrutinizing innovations in EMU design and propulsion systems, the lecture highlighted how these advancements contributed to energy efficiency, reduced environmental impact, and improved operational flexibility. A critical aspect of the technological evolution in railway rolling stock is the transition from steam engines to electric locomotives. The lecture also showed the intricacies of this transition, elucidating how electric locomotives offer superior performance, lower maintenance costs, and a cleaner environmental footprint. Additionally, the progress in regeneration technologies and optimum control mechanisms integrated into modern electric locomotives, showcased how these innovations enhanced energy efficiency and sustainability.

In conclusion, the presentation underscores the transformative impact of technological innovations on railway rolling stock, spanning from ICF design to Vandebharat and from steam engines to modern electric locomotives. Further, the lecture not only provided insights into the historical trajectory but also outlined future research avenues that hold the key to further revolutionizing the railways and ensuring a sustainable and efficient future for this vital mode of transportation.

The number of participants who attended the lecture was 38. The lecture was very informative, technically compelling and senior members / other colleagues interacted with the speaker constructively. Dr. Divakar Ramachandran, Director, MMG presented the Memento to the speaker. The event was received well within the research community and IIM members of MMG.

3) For the benefit of practicing engineers/students across all engineering domains, Two-day course on "Metallurgy for Practicing Engineers (MEPE 2024)" was organized by IIM Kalpakkam chapter at Hotel Radha Regent, Chennai during February 9-10, 2024. It is a unique course on Metallurgy in which eminent speakers from industries, research & academic institutions delivered lectures and provided a concise and thorough understanding of various facets of Metallurgical Engineering.

Dr. M. Vasudevan, Chairman IIM Kalpakkam Chapter welcomed the gathering and gave opening remarks. In his address, he mentioned about the importance of metallurgy in various industries including manufacturing, power, railways, defence and so on. Dr. Hemant Kumar, Convener MEPE 2024 briefed about the course and its genesis. The technical sessions started with the lecture on the topic "Selection of Materials for Engineering Applications" by Mr. G.S. Shankar, Caterpillar India Pvt Ltd. The next lecture was given by Dr. R. Suresh Kumar, IGCAR on the topic "Metallurgical Perspective of a Mechanical Engineer towards the Design & Fabrication". Dr. Hemant Kumar gave a lectures on "Stainless steels and its application in Industries" and "Heat treatment and surface modification process". Dr. Saurabh Dixit, MIDHANI delivered lecture on "Processing of Engineering materials". "Quality Assurance during Material processing" talk was given by Mr. M.V. Kuppusamy, IGCAR. Environmental degradation and its prevention talk by Dr. A. Poonguzhali, IGCAR. Day 2 started with lecture by Dr. A. Murugaiyan, IIT Madras on "Material Joining Technologies". Dr. R. Mythili, IGCAR gave talk on "Characterisation of Engineering Materials". Dr. Vani Shankar gave lecture on "Mechanical Testing and Evaluation". Dr. V. Karthik talked about "Small Specimen Testing". Dr. Anish Kumar gave lecture on "Non Destructive Examination". Dr. Hemant Kumar gave talk on "Failure Analysis of Engineering Components". At the end of technical talks, a quiz was conducted among the participants and prizes were distributed

to best five participants. Mr. P. Vasantharaja, Co-Convener, MEPE 2024 proposed vote of thanks. Total 52 participants from Industries, R&D Organizations and educational Institutions attended the course. The course was well received by the participants and provided them a basic understanding of metallurgy.

Glimpses of the event MEPE- 2024




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Member News Prof. Pinaki Prasad Bhattacharjee

Professor Pinaki Prasad Bhattacharjee, Department of Materials Science and Metallurgical Engineering, IIT Hyderabad, visited ETS Montreal, Canada, in December 2023 under the framework of the ASM-IIM Visiting Lectureship Award (2021) to deliver a seminar titled "Strategies for Tailoring Microstructure and Properties of High Entropy Alloys". The talk was organised jointly by ETS Montreal (Professor Mohammad Jahazi, Department of Mechanical Engineering) and ASM International, Montreal Chapter (Dr. Gholipour Baradari Javad). Many registered participants attended the lecture, including research scholars, postdoctoral fellows, and company persons from ETS Montreal, Concordia University, and nearby aerospace industries. A networking session and dinner preceded the lecture. The lecture was well received by the audience. The Q&A session was very interactive with many interesting questions and ideas.

Member News — Dr. Subhasis Sinha

Dr. Subhasis Sinha, Assistant Professor at the Department of Metallurgical Engineering, IIT (BHU) Varanasi, recently visited the United States with the ASM-IIM Visiting Lectureship Award. This visiting lectureship is a reciprocal program established jointly by the American Society for Materials (ASM) and the Indian Institute of Metals (IIM) whereby scientists, researchers and academicians from India and North America can visit and deliver lectures in North America and India, respectively. Dr. Sinha was the 2022 recipient of the award in the under 40 years age category and was presented with the award at the ASM Leadership Luncheon event at the IMAT conference held in Detroit, USA during October 16-19, 2023. He also visited Carnegie Mellon University, Pittsburgh, USA during his visit and delivered talks at the Department of Materials Science and Engineering, CMU Pittsburgh and at the IMAT conference in Detroit.

Dr. Subhasis Sinha receiving the ASM-IIM Visiting Lectureship Award from Prof. David B. Williams at the ASM Leadership Luncheon on October 16, 2023 at IMAT 2023, Detroit, USA.

Member News — Dr. Dhruva Kumar Singh

Dr. Dhruva Kumar Singh (2nd from left) receiving the VASVIK Award.

Dr. Dhruva Kumar Singh, Hon. Secretary, IIM Mumbai Chapter and Scientific Officer (H), Materials Group, Bhabha Atomic Research Centre, Mumbai was bestowed with prestigious VASVIK Award for Materials and Metallurgical Science & Technology for year 2022 on 19th January 2023 in Mumbai for his pioneering work on development of scalable technologies related to separation of rare earth element and production of RE compounds. This prestigious award recognizes individuals or group who have made remarkable contributions to Science & Technology, thereby contributing to sustainable development and national prosperity in India and is given by the Vividhalaxi Audyogik Samshodhan Vikas Kendra.

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Iron & Steel Statistics World & India

Crude Steel production by region

	Jan 2024 (Mt)	% change Jan 24/23	Jan-Jan 2024 (Mt)	% change Jan-Jan 24/23
Africa	2.0	16.3	2.0	16.3
Asia and Oceania	107.6	-3.6	107.6	-3.6
EU (27)	10.2	-1.8	10.2	-1.8
Europe, Other	3.9	22.5	3.9	22.5
Middle East	4.7	23.1	4.7	23.1
North America	9.2	-2.1	9.2	-2.1
Russia & other CIS + Ukraine	7.2	4.0	7.2	4.0
South America	3.4	-6.3	3.4	-6.3
Total 71 countries	**148.1**	**-1.6**	**148.1**	**-1.6**

The 71 countries included in this table accounted for approximately 98% of total world crude steel production in 2023. Regions and countries covered by the table:

- **Africa :** Algeria, Egypt, Libya, Morocco, South Africa, Tunisia
- **Asia and Oceania :** Australia, China, India, Japan, Mongolia, New Zealand, Pakistan, South Korea, Taiwan (China), Thailand, Viet Nam
- **European Union (27) :** Austria, Belgium, Bulgaria, Croatia, Czechia, Finland, France, Germany, Greece, Hungary, Italy, Luxembourg, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden
- **Europe, Other :** Macedonia, Norway, Serbia, Türkiye, United Kingdom
- **Middle East :** Bahrain, Iran, Iraq, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, Yemen
- **North America :** Canada, Cuba, El Salvador, Guatemala, Mexico, United States
- **Russia & other CIS + Ukraine :** Belarus, Kazakhstan, Russia, Ukraine
- **South America :** Argentina, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela

Top 10 steel-producing countries

	Jan 2024 (Mt)	% change Jan 24/23	Jan-Jan 2024 (Mt)	% change Jan-Jan 24/23
China	77.2 e	-6.9	77.2	-6.9
India	12.5	7.3	12.5	7.3
Japan	7.3	0.6	7.3	0.6
United States	6.8	-0.3	6.8	-0.3
Russia	6.2 e	1.2	6.2	1.2
South Korea	5.7	1.5	5.7	1.5
Türkiye	3.2	24.7	3.2	24.7
Germany	2.9 e	-0.9	2.9	-0.9
Iran	2.6	39.3	2.6	39.3
Brazil	2.5 e	-7.2	2.5	-7.2

e - estimated. Ranking of top 10 producing countries is based on year-to-date aggregate

Source : worldsteel.org

INDIAN STEEL MARKET ROUND-UP

The following is a status report on the performance of Indian steel industry during April-January 2023-24, based on provisional data released by Joint Plant Committee (JPC) in its MIS Report for April-January 2023-24. It is to be noted that total finished steel includes both non-alloy and alloy (including stainless steel) and all comparisons are made with regard to same period of last year.

Performance of Indian steel industry			
Item	**April-January 2023-24*(Mt)**	**April-January 2022-23 (Mt)**	**% change***
Crude Steel Production	118.947	104.816	13.5
Hot Metal Production	71.599	66.900	7.0
Pig Iron Production	5.911	4.914	20.3
Sponge Iron Production	42.651	36.049	18.3
Total Finished Steel (alloy/stainless + non-alloy)			
Production	114.424	101.052	13.2
Import	6.739	5.000	34.8
Export	5.521	5.329	3.6
Consumption	112.515	98.290	14.5
Source: JPC; *provisional; Mt=million tonnes			

Overall Production

- Crude Steel: Production at 118.947 million tonnes (Mt), up by 13.5%.
- Hot Metal: Production at 71.599 Mt, up by 7.0%.
- Pig Iron: Production at 5.911 Mt, up by 20.3%.
- Sponge Iron: Production at 42.651 Mt, up by 18.3%, led by coal-based route (81% share).
- Total Finished Steel: Production at 114.424 Mt, up by 13.2%.

Contribution of Other Producers

- Crude Steel: SAIL, RINL, TSL Group, AM/NS, JSWL Group & JSPL together produced 69.794 Mt (59% share) during this period, up by 5.8%. The rest (49.153 Mt) came from the Other Producers, up by 26.6%.
- Hot Metal: SAIL, RINL, TSL Group, AM/NS, JSWL Group & JSPL together produced 64.717 Mt (90% share) up by 3.7%. The rest (6.882 Mt) came from the Other Producers, up by 53.7%.
- Pig Iron: SAIL, RINL, TSL Group, AM/NS, JSWL Group & JSPL together produced 1.127 Mt (19% share) up by 6.7%. The rest (4.783 Mt) came from the Other Producers, up by 24.0%.
- Total Finished Steel: SAIL, RINL, TSL Group, AM/NS, JSWL Group & JSPL together produced 64.226 Mt (56% share) up by 8.4%. The rest (50.197 Mt) came from the Other Producers, up by 20.1%.

Contribution of Public Sector Units (PSU)

- Crude Steel: With 84% share, the Private Sector (99.368 Mt, up by 15.0%) led crude steel production compared to the 16% contribution of the PSUs (up by 6.4%).
- Hot Metal: With 71% share, the Private Sector (50.754 Mt, up by 7.1%) led hot metal production, compared to the 29% contribution of the PSUs (up by 6.8%).

- Pig Iron: With 95% share, the Private Sector (5.594 Mt, up by 21.8%) led pig iron production, compared to the 5% contribution of the PSUs (down by 2.0%).
- Total Finished Steel: With 86% share, the Private Sector (97.835 Mt, up by 14.2%) led production of total finished steel, compared to the 14% contribution of the PSUs (up by 7.6%).

Contribution of Flat /Non-Flat in Finished Steel

- Production: Non-flat products accounted for 55% share (up by 14.8%), the rest 45% was the share of flats (up by 11.3%).
- Import: Flat products accounted for 94% share (up by 36.8%), the rest 6% was the share of non-flats (up by 7.8%).
- Export: Flat products accounted for 88% share (up by 5.7%), the rest 12% was the share of non-flats (down by 9.9%).
- Consumption: Led by Non-flat steel (54% share; up by 14.6%) while the rest 46% was the share of flat steel (up by 14.3%).

Finished Steel Production Trends

- At 114.424 Mt, production of total finished steel was up by 13.2%.
- Contribution of the non-alloy steel segment stood at 106.69 Mt (93% share, up by 14.5%), while the rest was the contribution of the alloy steel segment (including stainless steel).
- In the non-alloy, non-flat segment, in volume terms, major contributor to production of total finished steel was Bars & Rods (48.489 Mt, up by 14.7%) while growth in the non-alloy, flat segment was led by HRC (43.69 Mt, up by 14.5%) during this period.

Finished Steel Export Trends

- Overall exports of total finished steel at 5.521 Mt, up by 3.6%.
- Volume wise, HR Coil/Strip (2.058 Mt) was the item most exported (37% share in total finished steel).
- Italy (1.186 Mt) was the largest export market for India.

Finished Steel Import Trends

- Overall imports of total finished steel at 6.739 Mt, up by 34.8%.
- India was a net importer of total finished steel in April-January 2023-24.
- Volume wise, HR Coil/Strip (2.896 mt, up by 71.4%) was the item most imported (43% share in total finished steel).
- China (2.176 Mt) was the largest import market for India (32% share in total).

Finished Steel Consumption Trends

- At 112.515 Mt, consumption of total finished steel was up by 14.5%.
- Contribution of the non-alloy steel segment stood at 103.659 Mt (92% share, up by 14.3%), while the rest was the contribution of the alloy steel segment (including stainless steel).
- In the non-alloy, non-flat segment, in volume terms, major contributor to consumption of total finished

steel was Bars & Rods (47.062 Mt, up by 13.7%) while growth in the non-alloy, flat segment was led by HRC (42.476 Mt, up by 14.0%) during this period.

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News Updates — Domestic

Higher coal prices seen impacting steel industry's growth plans

Higher prices of coal could slow down the debt reduction plans of Indian steel-makers, with leverage for the sector weakening to 2021 levels if input prices remain at the current levels, said S&P Global Ratings.

"We no longer think India's leading steel companies will shed debt in the coming fiscal year," said Anshuman Bharati of S&P said in a note. "Instead, debt should remain at the same level, due to narrower steel spreads that will feed into cash flows.

The firm sees the consolidated debt of major steel makers in the country -- which account for three-fifth of the country's production -- at 2.1 trillion rupees as on March 2025, up 150 billion rupees from what was previously estimated.

The Economic Times (14.02.2024)

JSW Steel crude steel production rises 7% YoY in Jan'24

The steel major said that its consolidated crude steel production for the month of January 2024 grew 7% to 23.62 lakh tonnes from 22.02 lakh tonnes steel produced in January 2023.

Production of Indian operations rose 6% YoY to 22.86 lakh tonnes. Production of JSW Steel USA-Ohio stood at 0.76 lakh tonnes in January 2024, up 55% from 0.49 lakh tonnes produced in same period last year.

JSW Steel, the flagship business of the diversified JSW Group, is India's leading integrated steel company.

The steel manufacturer reported a consolidated net profit of Rs 2,415 crore in Q3 FY24, steeply higher than Rs. 490 crore recorded in Q3 FY23. Revenue from operations grew by 6.87% year on year to Rs. 41,337 crore in the quarter ended 31 December 2023.

Business Standard (14.02.2024)

RINL seeks to sell 13.89 acres land in Visakhapatnam

Rashtriya Ispat Nigam Limited (RINL) has sought proposal for sale of non-core surplus freehold land parcels at its Visakhapatnam project. The move comes at a time when RINL is eying measures to trim debt. According to the request for proposal (RFP) document, RINL wants to sell 13.89 Acres of non-contiguous land plots. In all, 111 plots coupled into 19 blocks will be auctioned.

The loan on RINL is estimated to be Rs 22,000 crore and annual debt servicing obligation is around Rs 3,000 crore. The land being sold is spread across Visakhapatnam's HB Colony, Maddilapalem, Auto Nagar, and Pedagantyada. NBCC (INDIA) Limited has been appointed as the Technical cum Transaction Advisor for the bids. Properties can be inspected till March 5, and pre-bid meeting is called on February 28. The e-auction will take place from March 14 onwards.

The Economic Times (22.02.2024)

Kalyani Steels signs MoU with Odisha govt for manufacturing unit, to invest Rs 11,750 cr

Kalyani Steel Ltd signed an MoU with the Odisha government to set up a manufacturing facility with an investment of Rs 11,750 crore. The project for manufacturing titanium metal, aerospace and automotive components and advanced speciality steel at Gajamara in Dhenkanal district will create 10,000 job opportunities, the company said in a statement.

Chief Minister Naveen Patnaik said the collaboration will harness opportunities for the state to emerge as a high-skill job creator.

"By welcoming Kalyani Steels' project, including a titanium metal and alloy mill, an aerospace components facility, and an integrated automotive component unit, Odisha marks its grand entry into a highly advanced and precision manufacturing sector," he said.

Patnaik also said the project is a "perfect match for our aspirations for creating an ecosystem conducive to new-age industries".

The chief minister also said the project would catalyze the growth of micro, small and medium enterprises (MSMEs), spurring the development of a vibrant ecosystem of ancillary industries and OEM (original equipment manufacturer) suppliers, providing many more employment opportunities.

Kalyani Steels Ltd Director Amit Kalyani said the project signifies a milestone in the company's long-standing relationship with Odisha and promises mutual growth and prosperity.

The Economic Times (23.02.2024)

JSW Steel incorporates subsidiary for hot, cold-rolled steel products

JSW Steel announced incorporating a wholly-owned arm JSW Green Steel Ltd for the manufacture of hot-rolled and cold-rolled steel products. The arm was incorporated on February 27 in Mumbai and is yet to commence its business operations, JSW Steel informed the exchanges.

JSW Green Steel Ltd has now become its wholly-owned subsidiary, the company said.

"The new entity has been incorporated for manufacturing of hot-rolled and cold-rolled products of steel, which is in line with the main line of business of the company," JSW Steel said.

Hot-rolled steel finds applications in sectors like automobile, agriculture etc., while cold-rolled steel is used by industries manufacturing, construction and home appliances, among others.

The Economic Times (29.02.2024)

Mamata Banerjee inaugurates Shyam Steel's Rs 1500-cr plant in Purulia

West Bengal Chief Minister Mamata Banerjee virtually inaugurated Shyam Steel's Rs 1,500-crore integrated plant in Purulia district. This is the fourth facility of the company in the state with three others located in Durgapur and Bankura.

Spread over an area of 600 acres, the new steel plant at Raghunathpur will have a capacity of 1.19 million tonne, Shyam Steel director Lalit Beriwala said. The expansion will result in a consolidated capacity of 4.03 million tonne per annum (Mtpa), including finished steel of 1.36 Mtpa, he said.

With a current turnover of Rs 6,000 crore, Shyam Steel aims at strengthening its position in the steel industry, the official said.

The new steel facility will enable the company to produce high-quality steel products, catering to the growing demand of domestic and international markets, he added.

The Economic Times (27.02.2024)

India's steel exports hit 18-month high in January 2024

India's steel exports reached an 18-month high of 1.1 million tonnes in January 2024, driven by increased demand from the European Union and favourable global prices, according to a report by SteelMint.

"Good restocking demand from the European Union (EU) contributed 67 per cent of the 1.11 Mt (export) in January. It was highest in last 18 months," SteelMint said on the reasons behind the surge in exports.

The report also attributed the rise in exports to competitive domestic steel prices.

https://timesofindia.indiatimes.com/

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Non-Ferrous Metals Statistics Domestic Scenario

Production (unit : Lakh Tonnes)

	Jan'24	Dec'23	Nov'23	2022 - 23	2021 - 22
ALUMINIUM					
NALCO	0.40	0.40	0.38	4.60	4.60
HINDALCO*	1.13	1.12	1.09	13.22	12.94
BALCO	0.49	0.49	0.47	5.69	5.80
VEDANTA LTD	1.53	1.52	1.48	17.22	16.92
TOTAL	**3.55**	**3.53**	**3.42**	**40.73**	**40.26**
*Renukoot, Hirakund, Mahan, Aditya					
ZINC (One major producer)					
HZL	**0.70**	**0.70**	**0.65**	**8.21**	**7.76**
COPPER (Cathode)					
HCL	0	0	0	0.000073	0.62
HINDALCO	0.37	0.36	0.18	4.07	3.59
SSL	0.13	0.16	0.15	1.48	1.25
TOTAL	**0.50**	**0.52**	**0.33**	**5.55**	**4.85**
LEAD					
HZL	**0.17**	**0.16**	**0.20**	**2.11**	**1.91**

Source : https://mines.gov.in/

Prices in India (as on 22nd February, 2024)

(Mumbai Local Price in Rs. / kg)

Product	Rs. / kg	Product	Rs. / kg
Copper Armature	707	Aluminium Ingot	203
Copper Cathod	762	Aluminium utensil	162
CC Rod	765	Zinc Ingot	217
Copper Cable scrap	724	Lead ingot	184
Brass Sheet Scrap	516	Tin Ingot	2432
Brass Honey Scrap	487	Nickel Cathod	1433

Source : https://mtlexs.com/

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