



THE INDIAN INSTITUTE OF METALS KALPAKKAM CHAPTER

Chapter Report for the Year 2019-2020

Dear Members

I have great pleasure in presenting before you the 38th annual report of our Chapter today, the 17th of July 2020. During the last annual general body meeting held on 23th of April 2019, the following members were elected to the executive committee:

Chairman	Dr. Divakar. R
Vice-Chairman	Dr. C.K. Mukhopadhyay
Secretary	Dr. V. Karthik
Joint Secretary	Dr. B. Anandkumar
Treasurer	Dr. S. Ningshen
Ex Officio member	Dr. P. Parameswaran
Members	Dr. Rani P. George, Dr. R. Ramaseshan, Shri. V. Ganesan Dr. Hemant Kumar, Shri M. Shanmuga Sundaram, Dr. Chanchal Ghosh, Shri Vasantharaja, Shri S. Athimoolakrishnan, Dr. G.Sainath and Dr. Ch.Jagadeeswara Rao.

During the year 2019-20, the Chapter conducted various activities like Prof. Brahm Prakash Memorial Materials Quiz (BPMMQ), Dr. Placid Rodriguez Memorial Lecture (PRML), Theme meetings, Course on Metallurgy, Technical lectures, Foundation day programme and our chapter was also associated with NMD-ATM 2019 as Co-organizer.

Membership status

IGCAR has been a sustaining member of the Indian Institute of Metals (IIM), Kolkata, for many years now. We are happy to inform you that during the period of this report, 17 new members (3 Life members, 13 Associate members and 1 Ordinary member) have joined our Chapter. We welcome on board all new members and look forward for their active role in the chapter activities. The current membership of the Chapter stands at **237** with 156 life members, 10 fellow of IIM, 63 Associate members (AM), 4 Ordinary members (OM) and 4 student members (ST).

In this period, 4 of our senior members namely Dr. G. Amarendra, Dr. G. Sasikala, Dr. C. Ravishankar and Dr. C.K. Mukhopadhyay have superannuated from their service in IGCAR. Kalpakkam chapter places on record its appreciation of the services rendered by these eminent members to the materials and metallurgy community and in particular to our chapter activities. We wish them a healthy and prosperous life.

Awards and Honors

As you may be aware, IIM Kalpakkam chapter has bagged the second prize for best chapter award for the year 2018-19 in the large category. I thank all our members for their continued support in organizing and conducting various chapter activities which made it possible to receive this award in last two consecutive years.

We are very happy to inform that many of our members have obtained significant recognitions from national/international organizations and various professional bodies. We congratulate all the following members who have received awards and honours during the period of this report, and wish all members many more awards/honours in the coming years:

National/International Recognitions:

- ❖ Dr. U. Kamachi Mudali has been elected as Honorary Member, UDCT Alumni Association, Institute of Chemical Technology (ICT), Mumbai, 2019.
- ❖ Dr. U. Kamachi Mudali delivered the following invited lectures: Prof. Brahm Prakash Memorial Lecture at IIM Trivandrum Chapter, in July 2019; Diamond Jubilee Commemoration Lecture at IIM Bangalore Chapter in Aug. 2019; Vikram Sarabhai Memorial Lecture at ITM University, Baroda in Oct. 2019; OP Jindal Memorial Lecture, at Jindal Steel Works Ltd., Vijayanagar in Dec. 2019.
- ❖ Dr. Sandip Dhara delivered the Plenary Presentation on “Localized Phonon Population in Semiconducting Si Nanowires” in Intl. Conf. on Perspective of Vib. Spectros. (ICOPVS) JNCASR, at Bangalore, 24-29 Feb. 2020.
- ❖ Dr. S. Ningshen was conferred the Scientific and Technical Excellence Award for 2018-19 under Excellence in Science, Engineering & Technology Award Scheme from DAE.
- ❖ Dr. V. D. Vijayanand was conferred with Young Applied Scientist/Technologist Award from DAE for the year 2018.
- ❖ Dr. Sandip Dhara took over as an Editorial Board Member in the following reputed Journals - *Journal of Photonics Research* (Clausius Scientific Press, CSP); *Modern Physical Chemistry Research* (CSP); *Progress in Materials Chemistry and Physics* (CSP).
- ❖ Dr. Arup Dasgupta has taken over as the Managing Editor of *Transactions of the Indian Institute of Metals* from April 2020.
- ❖ Dr. Chanchal Ghosh was presented with “Excellence in Microscopy Award” from Electron Microscope Society of India.
- ❖ Dr. Haraprasanna Tripathy was conferred the “ITAS Young Scientist Award” from Indian Thermal Analysis Society (ITAS).
- ❖ Dr. S C Vanithakumari was awarded the “NIGIS Corrosion awareness Award 2019” for Distinction in Corrosion Science & Technology by NACE International Gateway India Section.
- ❖ Dr. Kishore K. Madapu received the “Best Thesis Award” in DAE SSPS Symposium 2019 from DAE.
- ❖ Shri. B. Aashranth was awarded with “Outstanding M. Tech. Student” from Homi Bhabha National Institute.
- ❖ Dr. Sandip Dhara’s student (Dr A.K.Sivadasan) was awarded the Outstanding doctoral student award winner with Homi Bhabha Gold Medal by HBNI for the year 2019.

- ❖ Ms. Bhavana Unikela was presented with “Associate Engineers Award 2019” for the best M. Tech thesis from The Indian Institute of Welding.
- ❖ Ms. Madhura Bellippady received “NIGIS Best M. Tech Award-2019” for the Thesis titled “Corrosion Behavior of Pyrolytic Graphite in LiCl-KCl-UCl₃ Molten Salt for Pyrochemical Reprocessing Application” from NACE International - Gateway India Section.
- ❖ Ms. Madhura Bellippady received Corrosion Awareness Award 2019, under the M Tech/MSc (Engg.) Thesis Category, during CORCON 2019 - International Corrosion Conference and Expo, Mumbai, 23-26 Sep. 2019.
- ❖ Dr. W. Sharatchandra Singh was conferred with the “Outstanding Reviewer Awards 2019” for Journal Measurement Science and Technology from IOP Publishers.

➤ **Best Oral presentation/poster Paper Awards**

- ❖ C. K. Mukhopadhyay and S. Thirunavukkarasu, Non-destructive Evaluation Techniques for Inspection of Components in Nuclear Applications Journal of Nondestructive Testing & Evaluation, Volume 17 (18), 2019, pp. 26-31. Best Technical Paper Award in the Industrial Application Category, presented by ISNT during NDE 2019, 5 Dec. 2019.
- ❖ K. Mariappan, Vani Shankar, and A. K. Bhaduri, Effects of microstructures and cyclic loading on mechanical properties of simulated HAZs of P91 steel weldment, “ADMAT MetDef, 2019” - Best Oral Presentation Award from DRDO, Hyderabad.
- ❖ Anoop K Unni, and M. Vasudevan, Numerical Modelling of Fluid Flow and Weld Penetration in Activated TIG Welding, “International conference of Materials and Manufacturing Methods”, NIT Trichy, July 2019 - Best Paper Award.
- ❖ Bhavana U, H.C. Dey, and Shaju K. Albert, Development of Repair Welding Procedure for Service Exposed Alloy 617M Boiler Tube , “National Welding Seminar 2018”, Cochin, The Indian Institute of Welding - Best Paper Award - EWAC Alloys Award 2019.
- ❖ Sangeetha Jayakumar, T. Nandakumar, M. Vadivel, C. Thinaharan, Rani P. George, and John Philip, Tamarind fruit pulp based green corrosion inhibitor for mild steel in acidic environment, “RANCSD-2019”, Madras Christian College, Chennai, 12-13 Dec. 2019 - Best Oral Presentation Award from ACS Applied Nano Materials.
- ❖ A. Poonguzhali, S. Ningshen, and G. Amarendra, Corrosion Kinetics Study of 316N Weldment Under Cyclic Loading in Acidified Chloride Environment, “International Conference on Advances in Minerals, Metals, Materials, Manufacturing and Modelling (ICAM-2019)” NIT, Warangal, 25-27 Sep., 2019 - Best Paper Award.
- ❖ A. Poonguzhali, S. Ningshen, and G. Amarendra, Influence of artificial pit on corrosion fatigue behavior of 316LN SS and its weldment, NMD-ATM, Trivandrum, 13-16 Nov., 2019 - Best Paper Award.
- ❖ A.R. Pavan, B. Arivazhagan, S. Arun Kumar, M. Vasudevan, and S. Mahadevan, Numerical Simulation and Experimental Validation of A-TIG Welding of 2.25Cr-1Mo Steel, “2nd International Conference on Computational Methods in Manufacturing”, IIT Guwahati, 8-9 March, 2019 - Best Paper Award from IIT-Guwahati & Springer.

- ❖ M. Arvinth Davinci, Influence of Large Strain Hot Deformation on Microstructural Evolution in Alloy D9 “2nd International Conference on Metallurgy, Materials Science and Manufacturing (IMME19)” NIT, Tiruchirappalli, 27-28 Dec. 2019- Best Paper Award.
- ❖ Raktima Basu, and Sandip Dhara, Observation of cumulative spin-excitation in VO₂ using polarized TERS study, “Intl. Conf. on Perspective of Vibrational Spectroscopy (ICOPVS-2020)” JNCASR, Bangalore Feb. 24-29, 2020- Best Oral Presentation Award.
- ❖ Raktima Basu, Avinash Patsha, Sharat Chandra, and Sandip Dhara, Study of phase transition in VO₂ using Tip-Enhanced Raman Spectroscopy, “National Conference on Light Matter Inter. at Nanoscale (LMIN)” IGCAR, Kalpakkam, 15-17 July 2019 - Best Oral Presentation Award.
- ❖ Surojit Ranoo, B.B. Lahiri and John Philip, Enhancement in field induced heating efficiency in TMAOH coated super paramagnetic Fe₃O₄ nanoparticles by texturing under a static magnetic field, “International conference on magnetic fluids(ICMF2019)” Paris, France, 7-12 July 2019 - Best Paper Award.
- ❖ Arjun Pradeep, Anil Kumar Sharma, D. Ponraju, B. K. Nashine, and P. Selvaraj, Aerosol penetration in submerged gravel bed scrubber, “7th Asian Symposium on Computational Heat Transfer and Fluid Flow – 2019”, Tokyo, Japan, 3-7 Sep. 2019 - Best Paper Award.
- ❖ Geetisubhra Jena, Rani P. George, John Philip and G. Amarendra, Development of silanized graphene oxide based multifunctional hybrid coating with enhanced corrosion resistance and antibacterial activity in seawater environment, “National Symposium on Electrochemical Science and Technology (NSEST- 2019)”, Indian Institute of Science Bengaluru, 19 -20 July 2019 - Best Paper Award.
- ❖ T. P. Rasitha, S. C. Vanithakumari, Rani P. George and John Philip, Porous microcapsule based superhydrophobic coating on 304L SS and its corrosion properties in chloride medium, “International Conference and Expo on Corrosion (CORCON 2019)” Navi Mumbai, 23 - 26 Sep. 2019 - Best Poster Award.
- ❖ Sudha Uthaman, Vinita Vishwakarma, D. Ramachandran, B. Anandkumar, Rani P. George and U. Kamachi Mudali, Performance characteristics of nanophase modified fly ash concrete for marine applications, “International Conference and Expo on Corrosion (CORCON 2019)” Navi Mumbai, 23 – 26 Sep. 2019 - Best Poster Award.
- ❖ Chowdhury Abinash Bhuyan, Kishore K. Madapu, and Sandip Dhara, Large-Area Synthesis and Transfer of Monolayer MoS₂ onto Flexible Substrate, “Intl. Conf. on Nano Sci. and Nanotech. (ICONSAT) SNBCBSC, Kolkata, 5-7 March 2020 - Best Poster Award.
- ❖ Binay Kr. Sahu, Santanu Parida, Sandip Dhara and Arindam Das, TERS study in understanding the observation of forbidden vibrational mode in SnO₂ nanoparticle, “Intl. Conf. on Perspective of Vibrational Spectroscopy (ICOPVS-2020)” JNCASR, Bangalore Feb. 24-29, 2020 - Best Poster Award.

➤ **Group Achievement Awards from DAE**

- ❖ *Indigenous Development of Indian Advanced Fast Reactor Clad (IFAC-1) for Sodium Cooled FBRs.* Dr. Shaju K. Albert, MMG (Group Leader); Dr. Arun Kumar Bhaduri,

(Member), Dr. G. Amarendra. (Member), Dr. Gondesh Vara Prasad Reddy, Dr. Hemant Kumar, Shri M. Arul, Dr. V. D Vijayanand, Shri B. Aashranth, Dr. Diptimayee Samantaray, Shri Arvinth Davinci, Dr. S. Latha, Dr. G. Sasikala, Shri M. Nandagopal, Shri V. Ganesan, Dr. Kinkar Laha, Shri Utpal Borah, Dr. S. Ravi, Dr. S. Raju, Dr. P. Parameswaran and Dr. Haraprasanna Tripathi, Dr. Christopher David, Shri N. Raghu, Shri K. Krishna Chaitanya,

- ❖ *Development of a Dual Ion Irradiation Platform for Studies of Radiation Response in Fission and Fusion Reactor Materials.* Dr. G. Amarendra, (Group Leader); Shri K. Suresh, Shri S. Chinnathambi, Dr. S. Balaji, Dr. Sachin Kumar Srivastava, Shri P. Magudapathy, Shri J. Navas, Shri A. Parthasarathi, Shri G. Natarajan, Dr. Christopher David, Dr. R. Govindaraj, Dr. M. Kamruddin

Activities during the Year 2019-20

During the year 2019-20, the Chapter organized several technical programmes as detailed below:

A. Prof. Brahm Prakash Memorial Materials Quiz

IIM-Kalpakkam Chapter conducted the *27th Prof. Brahm Prakash Memorial Materials Quiz (BPMMQ)- Grand Finale* during September 20-21, 2019. A total of thirty three (33) teams comprising of sixty six students accompanied by escorts and office bearers from Nineteen (19) chapters across India participated in this flagship programme.

On September 20, 2019, the Metal Camp programme commenced with welcome by Dr. Divakar R., Chairman, IIM Kalpakkam and special address by Dr. G. Amarendra, Chairman – BPMMQ 2019. A video film “Kalpakkam on Course” highlighting the various reactor facilities and research laboratories at Kalpakkam was screened. This was followed by *Prof. Brahm Prakash Memorial Lecture 2019*, delivered by Dr. G. Amarendra, Distinguished Scientist and Director, Metallurgy and Materials Group, IGCAR, on the topic “Effects of Radiation on Materials”. The speaker presented an overview of the structural materials used in nuclear reactors and the type of radiations they are exposed. He lucidly explained how materials behave differently and their properties alter under irradiation. This was followed with visit of students and escorts to the facilities at Kalpakkam namely Fast Breeder Test Reactor (FBTR), Madras Atomic Power Station – (MAPS) and the Nuclear Desalination Demonstration Plant (NDDP).

On September 21, 2019, the quiz programme commenced with drawl of lots for the preliminary rounds held in six parallel sessions. The winner and runner of each session contested in semifinal round held in two parallel sessions. A total of six teams (three from each semi-final round) were selected for the Grand Finale. Dr. Sumanth C. Raman, a renowned sports quiz master from Chennai conducted the *Grand finale of BPMMQ 2019*. The Finale comprised of eight rounds with audio, video, dumb charades and rapid fire rounds. The winner of BPMMQ 2019 was IIM Bangalore Team – A comprising of Ashutosh M. Bharadwaj and Bharath Shankar of National Public School, Rajaji Nagar, Bangalore. IIM Trichy Team-B comprising of P. Harshavarthini and V. Srideiva Prasanna of Sri Jayendra Swamigal Silver Jubilee MHSS, Tirunelveli won the second place.

The *essay cum elocution contest* for the quiz participants also was well received this year. The topics were (i) “Evolution of the Periodic Table of Elements – Is it complete?” (ii) “Destination Moon – A materials Perspective” and (iii) “Ocean Bed – Store House of Rare Metals and Minerals. A total of nineteen (19) essays (7 in Periodic Table; 6 in Materials -

Moon; and 6 in Rare metals) were received. Six best essays were selected for elocution contest. The selected participants rendered excellent elocution and was judged by a three member jury of eminent experts from IGCAR, Kalpakkam. Ms. Arpita Mahapatra, D.A.V. Public School, Kalinga, Angul Chapter, was the winner of Essay/Elocution contest for the topic “Evolution of the Periodic Table of Elements – Is it complete?” and Agnidh Ghosh, Loyola School, Bistupur, Jamshedpur Chapter, was the runner of this contest for the topic “Destination Moon – A materials Perspective”. A souvenir **BPMMQ 2019 Digest** containing the essay articles selected for elocution contest and special messages from dignitaries was released on this occasion.

The Winner and Runner teams of the Quiz and the elocution contest were awarded with prizes by Dr A.K. Bhaduri, Director IGCAR, Kalpakkam. The event was successfully conducted with generous financial supports from Department of Atomic Energy, The Indian Institute of Metals, Indira Gandhi Centre for Atomic Research, JSW Centre, Mumbai, ARCI, Hyderabad, NFC, Hyderabad, MIDHANI, Hyderabad, Madras Atomic Power Station, BHAVINI, Heavy Water Board, Mumbai, and several leading firms dealing with metallurgical equipment and services. Dr. B. Anandkumar, Convener BPMMQ 2019 proposed a vote of thanks.

B. Dr. Placid Rodriguez Memorial Lecture (PRML)

The *eleventh Placid Rodriguez Memorial Lecture* was organized on **05th October 2019** at **GSO Auditorium, Kalpakkam**, jointly by Kalpakkam and Chennai Chapters of Indian Institute of Metals. Dr. Shaju K. Albert, Chairman, PRML Committee welcomed the gathering and Dr. M. Kamaraj, Member, PRML Committee, briefly dwelt upon the genesis of Dr. Placid Rodriguez Memorial lecture and the details of the series of lectures conducted since 2009. Dr. G. Amarendra, Distinguished Scientist & Director, Materials Science Group and Metallurgy & Materials Group, IGCAR, Kalpakkam, in his presidential address, recollected the pioneering contributions of Dr. Placid Rodriguez to the materials development for Fast Reactor programme of the country and shaping up human resources in defence programmes and academic institutions. Dr. Srinivasa Rao Bakshi, Chairman, IIM Chennai Chapter introduced the PRML 2019 speaker Dr. S. Somanath, Distinguished Scientist & Director, Vikram Sarabhai Space Centre, ISRO.

Dr. Somanath, in his lecture titled “***Progress in Materials Technologies & Vision for Indian Space Program***” first paid homage to the visionaries Dr. Vikram Sarabhai and Dr. Brahm Prakash who initiated the materials development and indigenization in ISRO by collaborating with public sector enterprises and industries to meet the challenges of quality aerospace materials for realization of different systems. He dwelt on the indigenization of steels such as 15CDV6 and M250 for the solid motors, Aluminium alloys for launch vehicles and production of Titanium sponge. Dr. Somanath explained the story of Titanium from sand to space to explain the synergy between VSSC and other partner organizations and industries. He further highlighted new developments in materials aimed towards cost reduction, production friendly and cost effective approaches like flow forming of steel motor case and additive manufacturing for complex integral parts made of Titanium, Stainless steel etc. The speaker finally shared the long term plans of ISRO mainly human space missions where higher levels of quality in material processing and qualification needed to be achieved. He concluded the lecture by stressing the importance of synergy between research institutes, academics, and industry in strategic sectors like Space, Nuclear energy and Defense. The lecture was very well received by the 100-strong audience comprising scientists, young research scholars and a few school teachers & students. Dr. G. Amarendra presented the

PRML memento to Dr. S. Somanath and the programme concluded with a vote of thanks by Dr. Rani P. George, Convener, PRML 2019.

C. Theme Meetings

Our chapter has been conducting theme meetings with the aim of disseminating the current knowledge as well as the emerging trends on various topics of interest to metallurgists and material science community for the benefit of IIM members. The following theme meetings were held during the period of this report.

C1. Theme meeting on Deformation and Fracture

A half-day theme meeting on “Deformation and Fracture” was organized on 31st May, 2019 at IGCAR. This theme meeting was aimed to provide a broad overview of the deformation and fracture related issues of materials employed in India’s Fast Reactor, Fusion Energy and Advanced Ultra-Supercritical (AUSC) Mission programmes. The topics included deformation of materials at low and high temperatures, dynamic fracture, elasto-plastic fracture mechanics, crack growth, modelling of materials deformation, structural integrity and life assessment procedures.

The welcome address by Dr. G. Amarendra, Director MMG & MSG was followed by opening remarks by Dr. A.K. Bhaduri, Director IGCAR, where he stressed the role of fracture mechanics in high temperature design and highlighted its relevance to fast reactor and the AUSC plant components. The first lecture was delivered by Dr. Aniruddha Moitra, Head MMS, MDTD, in which he presented an overview of materials and mechanics research at IGCAR over the last twenty-five years. The talk highlighted the use of RBR method for ductile fracture parameters, work on reference temperature prediction from instrumented Charpy tests and experimental facilities established for fracture toughness characterisation. The second lecture delivered by Dr. V. Karthik dwelt on the dimensional and tensile properties of neutron irradiated 316 stainless steel components of FBTR. The third lecture delivered by Dr. J. Christopher featured predictive models for creep behaviour using microstructure based damage mechanics approach. The final talk was delivered by Shri Yatindra Kumar on study of creep crack growth behaviour of steels and their weldments. The theme meeting was well attended by around 90 members who interacted with the speakers through question and discussions. The vote of thanks was given by the convener of the theme meeting Shri P. Vasantharaja.

C2. Theme meeting on Sheet Metal Forming

A theme meeting on “Sheet Metal Forming” was conducted on 31st Dec, 2019 at IGCAR, Kalpakkam. The meeting was aimed at sharing recent developments on the mechanics and experimental techniques in sheet metal forming. The programme commenced with welcome address by Dr. Shaju K Albert, Director, Metallurgy and Materials Group, followed with inaugural address by Dr A.K. Bhaduri, Director, IGCAR, on the application of sheet metal forming in various manufacturing industries and its relevance to the nuclear industry.

The programme comprised of four lectures by eminent professionals working in this field. The first lecture was delivered by Dr. C. Ravishankar providing an overview of Forming limit diagrams (FLD). His presentation covered the modelling and experimental aspects of hemispherical punch stretching process for determination of FLD of sheet metal. The second talk was delivered by Dr. Sivasambu Mahesh on Dislocation structures in plastically deformed grains. The third lecture delivered by Sri S.C.S.P. Kumar Krovvidi dwelt on the challenges in sheet metal forming of various reactor components with focus on large bellows. The final talk was delivered by Ms. Teena Mouni on stretchability of commercial pure

Titanium sheet. The programme was convened by Sri Utpal Bora and was well attended by over 70 participants.

C3. Theme meeting on Thin films and characterization

A theme meeting on Thin films and characterization was organized by IIM, Kalpakkam Chapter on 27th Feb 2020. Welcoming the gathering, Dr.S.Raju, Outstanding Scientist and Associate Director, Materials Characterisation Group highlighted the importance of the subject for the various technologies related to nuclear energy and appreciated the efforts of IIM Kalpakkam. As part of opening remarks, Dr.Shaju K Albert, Outstanding Scientist and Director, Metallurgy & Materials Group, highlighted that the domain of thin films has been an important R & D area in several laboratories of the Department of Atomic Energy as the applications of thin films are myriad either in the form of sensors and devices or neutron detectors and several possible function applications of sensor can be generated through systematic R & D in this field.

The first lecture was delivered by Dr. R. Mythili, Head, SMSMS, Physical Metallurgy Division bringing out the work on the “applications of thin films and coatings”. The speaker dwelt on the application of MgO as coating on stainless steel for sodium incineration tanks and adoption of plasma nitriding for enhancing the wear resistance of FBR components. The second lecture was delivered by Dr. S. Ilango, Head, SND, Materials Science Group on “characterisation of thin films”, in which he presented the application of SIMS to understand the surface and subsurface matter.

The third lecture was on “Semiconducting metal oxide thin films for gas sensing applications in fast reactors and allied facilities” presented by Dr.A.Sree Rama Murthy, Materials Chemistry Division, IGCAR. He elaborated on application of tin oxide thin films for hydrogen sensing in argon cover gas in liquid sodium vessels and presence of hydrogen in air and Indium oxide for NO₂ monitoring in nuclear reprocessing plants. The final lecture was delivered by Smt.T. Ezhilarasi, Scientific officer/G, Physical Metallurgy Division on her experience in plasma nitriding of large components.

The theme meeting was attended by members of the IIM KC who interacted well with the speakers of the day. The convener of this programme, Dr. P. Parameswaran, Head, Physical Metallurgy Division proposed the vote of thanks.

D: Workshop/Courses:

The IIM, Kalpakkam Chapter conducted a two days course on “*Metallurgy for Practicing Engineers*” (*MEPE – 2020*) at Hotel Radha Regent, Chennai, during 31st Jan – 1st Feb, 2020. The course was aimed at disseminating the basics of metallurgy to practicing engineers from the industry and research institutes.

The course was organized in eight technical sessions over two days covering topics such as Selection and Design of Materials, Processing of Engineering Materials, Melting & Casting, Joining Techniques, Heat-treatments, Quality Assurance, Physical and Mechanical characterization, Non-destructive testing, Environmental Degradation, Failure Analysis and Steel for special applications. Dr. Hemant Kumar welcomed the participants and presented an overview of the topics for the two day programme. The technical programme kick started with opening remarks by Dr. Shaju K. Albert, Director, Outstanding Scientist and Director, Metallurgy & Materials Group, IGCAR, in which he brought out the importance of materials in our day-to-day life with few examples and highlighted the role of metals and metallurgy in diverse industries such as automobile, power, chemical, oil and marine. The speakers for the lectures on various topics included professionals and experts from Caterpillar India Pvt, Sundaram Clayton Ltd., Fluidtherm Technology Pvt. Ltd., Annamalai University, IGCAR and MIDHANI. The course was attended by over seventy participants from various industries

all over the country such as NTPC, JSW Steel Ltd., Rane TRW steering systems, NLC, Rane Engine Valve Ltd., MIT Chennai, Ducom Instruments, Ashok Leyland, Rane (Madras) Ltd., NPCIL, BARC, HWB, IGCAR and NIOT.

Dr. C.K. Mukhopadhyay, Vice Chairman, IIM Kalpakkam Chapter handed over certificates to the participants and Dr. Hemant Kumar presented a summary of the course and invited feedback from participants. The event was supported by Mishra Dhatu Nigam Limited, Hyderabad, Netzsche, Metallic Bellows, IPGI, APEX, Pyrodynamics and SB Industries. The course was conceived and organized by Dr. Hemant Kumar as Convener and Dr. G. Sainath as co-convener with the support of EC members of Kalpakkam chapter.

E. NMD-ATM 2019

IIM Kalpakkam chapter was associated with the National Metallurgist Day-Annual Technical Meeting (NMD-ATM 2019) held at Trivandrum during 13-16 Nov 2019, as one of the co-organisers. Dr Divakar R. as Chairman of the International Symposium on Advanced Materials for Industrial and Societal Applications (AMISA), played a lead role in conceiving, planning and conducting the one day International symposium which featured one plenary and 14 keynote lectures by eminent personalities from across the world and also a panel discussion. Dr. P. Parameswaran and Dr. V. Karthik contributed as members in the organising committee of AMISA-19. Invited speakers for ATM included senior members from our chapter and members also served as session chairman and floor managers for various technical sessions.

F. IIM Foundation Day Lecture

A special gathering of IIM members was organised at IGCAR on 26th February, 2020 by Kalpakkam Chapter to commemorate the Foundation day of the Indian Institute of Metals (IIM), led by Dr. Shaju K. Albert, Director, Metallurgy and Materials Group, and with senior colleagues, scientists and engineers from DAE units at Kalpakkam attending. Dr. Divakar R., the Chapter Chairman and Associate Director, Materials Engineering Group welcomed the gathering and recalled the past and present activities of the Chapter and Head Quarters. Dr. K. Madangopal, Associate Director, Materials Group, Bhabha Atomic Research Centre, Mumbai was the distinguished speaker on the occasion. He delivered the IIM Kalpakkam Chapter Foundation Day lecture 2020 on the topic “**Shape Memory Alloys**”. He shared his immense research experience on shape memory effect including aspects related to microstructural reversibility, irreversibility and deformation twinning. Dr. Madangopal reviewed recent developments and shared exciting new applications of shape memory materials in various fields such as medicine and civil engineering, covering examples from metallic alloys, ceramics and even polymers. Applications include stents, actuators, damping for civil structures and architecture, and critical components for Tejas aircraft. Around 100 participants belonging to different groups participated in this edition of IIM Foundation Day event at Kalpakkam. The occasion afforded the Kalpakkam Chapter an opportunity to canvas for new members.

G. E-News Letter and Website of IIM KC

The 8th issue Vol. 2 of the E-newsletter of the chapter “Materials Matter” is ready for release in July 2020, thanks to the efforts of the editor Dr. G. Sainath. Besides the highlights of chapter activities in the current year, this edition will feature an interesting article on Covid 19 and metal alloys.

The website of IIM Kalpakkam Chapter has been live with the efforts of Sri Aashranth and Dr. R. Ramaseshan. All information related to the BPMMQ and MEPE course including course material were disseminated to the participants through website.

H. Technical Talks

During the period of this report, 10 technical talks on wide ranging topics of interest to the metallurgy and materials community, were arranged and conducted by Kalpakkam chapter. The details are given in the table below.

Sl. No	Date	Name	Organization	Topic
1	11/07/2019	Dr. Shashi Bhushan Arya	NITK, Suratkal	Role of passivity on corrosion and flow accelerated corrosion.
2	12/07/2019	Dr. S. Anand Kumar	IIT, Jammu	Role of surface modification processes: Microstructural and mechanical properties of metallic materials
3	16/08/2019	Dr. Abir Bhattacharyya	IIT, Jodhpur	Cyclic plasticity in bearing steels subjected to rolling contact fatigue
4	07/11/2019	Dr. Ravi Shanker Vidyarthi	BITS Pilani, Hyderabad	Effect of Flux on A-TIG Weldments
5	08/11/2019	Dr. Gordon J. Thorogood	Australian Nuclear Science & Technology Organisation Australia	Applications of X-ray and Neutron scattering in nuclear waste forms
6	20/11/2019	Dr. Ilaksh Adlakha	IIT, Madras	Atomic Insights on Hydrogen Embrittlement in α -Fe
7	10/12/2019	Dr. Sourav Das	IIT, Rorkee	Continuously cooled bainitic steel with > 1200 MPa strength and 20% elongation: from concept to reality
8	02/01/2020	Dr. Shyam Kanta Sinha	Institut de Physique et Chimie des Matériaux de Strasbourg (IPCMS), CNRS, France	Investigation of surfaces and interfaces down to the atomic scale using aberration corrected transmission electron microscopy
9	30/01/2020	Shri S. Clement Ravi Chandar	Reactor Design and Technology Group, IGCAR, Kalpakkam	A Journey from FBTR to PFBR and Beyond
10	19/02/2020	Dr. Syed Nizamuddin Khaderi	Indian Institute of Technology, Hyderabad	Challenges in Experimental and Numerical Impact Mechanics Research

I. Transactions of The Indian Institute of Metals and Metal news

Transactions of the Indian Institute of Metals, a flagship international journal of the Indian Institute of Metals is headed by Prof. B. S. Murty, Chief Editor. This year, one of our senior members, Dr. R. Sandhya has stepped down as Managing Editor, Trans. IIM. after long years of distinguished service. We are happy to note that Dr. Arup Dasgupta of our Chapter has been appointed as Managing Editor. The Springer journal currently has an Impact Factor of

1.205 (2019) with close to 90000 downloads clocked in 2019. The journal's rejection rate is in excess of 70% at the moment. The journal publishes 10 regular issues and 2 special issues per year. Many of our members are serving as reviewers for articles submitted to this journal; Dr. J. Ganesh Kumar, Dr. Nagesha, Dr. R. Mythili, Dr. Prasad Reddy, Dr. C. K. Mukhopadhyay, Shri M. Nani Babu, Dr. S. Ningshen, Dr. Dipti Samantaray and Dr. Hemant Kumar being recognised as amongst the top reviewers for their services by the Journal.

J. Interactions with Head Office and participation in Council meetings

Our members are on the National Council of the Indian Institute of Metals and have consistently ensured representation of Kalpakkam at the Council meetings held at Trivandrum and Kolkata over the past year, with support from IGCAR. Dr. Divakar, as Chairman Chapter Relations Committee, has played a lead role in enhancing the coordination among Chapters, monitoring the status of various Chapters and in identifying remedial actions where required. Our chapter has been regularly submitting the GST related transaction details to Head office to enable filing of GST returns in time.

The EC had interactive meetings with Dr. U. Kamachi Mudali, President, IIM at Kalpakkam on two occasions in this period. The chapter activities were presented and President IIM offered his advice and suggestions for enhancing the membership, sustaining the ongoing programmes and reaching out to the industries and academia.

K. Forthcoming events

Following activities are scheduled for the year 2020-21:

(i) Prof Brahm Prakash Memorial Materials Quiz (BPMMQ)

In view of the unprecedented situation in the country due to the Covid -19 pandemic, the Prof. Brahm Prakash Memorial Materials Quiz (BPMMQ)-Grand Finale is cancelled for 2020. However, it is planned to conduct the essay competition, the details of which are being worked out and will be rolled out shortly. Conducting the elocution and BPMMQ lecture in online mode will also be explored.

(ii) Dr. Placid Rodriguez Memorial lecture (PRML)-2019, at Chennai

A decision to conduct PRML in Oct 2020 will be appropriately taken in consultation with PRML committee and IIM Chennai.

(iii) Technical talks & Special lectures, Theme meetings

It is proposed to organize technical lectures through webinars.

(iv) Knowledge promotion through Course – CoSS (Course of Stainless Steel)

(v) 8th International Conference on Creep, fatigue and Creep-Fatigue Interactions (CF-8)

- Due to uncertainties in the feasibility of conducting the Conference in Feb. 2021, the organizers of CF8 are working out a fresh schedule.

(vi) Programme at Student Affiliate chapters (AVIT, Paiyanoor)

(vii) Inter-chapter meet

(viii) Membership drive

L. Awards for the Best Technical Journal papers from members

Nominations were received from IIM members for the best technical paper published in Journals in the period of this report under (i) young researcher categories (< 35 years) and (ii) general category. A total of 34 papers (18 in young researcher category and 16 in general category) were received and judged by a panel of jury. Cash prizes will be awarded to the authors of the two best papers in each category.

The Executive committee (EC) places on record its sincere thanks to Dr. A.K. Bhaduri, Director, IGCAR and Dr. Shaju. K. Albert, Director MMG & MSG, for their encouragement, guidance and support for all our chapter activities. Special thanks to two of our senior members who have superannuated from service in this period: Dr. G. Amarendra, former Director MMG & MSG, IGCAR, for his involvement and advice on chapter activities and Dr C.K. Mukhopadhyay for his services as Vice Chairman of our chapter. Our thanks to Dr. U. Kamachi Mudali, President, IIM and officials of Head Office, Kolkata, for valuable advice and guidance.

The activities of IIM Kalpakkam chapter presented here is a team work of all the members of the EC as well as the conveners of various programmes and I gratefully acknowledge their support. I, on behalf of EC, sincerely thank all members of our chapter for their wholehearted support and cooperation for conducting various programmes during this year. We look forward to your continued support and active participation in the activities of our Chapter in the coming years. Thank You.



(V. Karthik)

Secretary, IIM Kalpakkam Chapter

10/07/2020