



FESEM



Chemical Vapour Deposition System



Electro Spinning Apparatus

From Director's Desk

It is my great privilege to present the latest issue of Agrasar before you. This issue brings us to the end of the financial year, which is the time for looking back, contemplate and set new goals for our R&D activities.

This year gave us the opportunity to transfer three technologies to various industries, - technology of Radiation Shielding Materials for broad application spectrum, Advanced Pavers Block from Copper Tailings and knowhow for Deflouridation of drinking water using Nanoadsorbent based Domestic Filter. This realization of technologies through industries will not only give masses the accessibility to cheaper and innovative products but also strengthen our commitment towards a cleaner and greener environment.

We are also starting various new projects. At the level of infrastructure, we are improving. I am extremely privileged to join such a family and I am sure we will reach further heights continuing with the positive attitude and the team spirit.

Avanish Kumar Srivastava
Director
CSIR – AMPRI, Bhopal



In this issue

- From Director's Desk
- Institute- Industry Integration - 2018
- AMPRI Signs Agreement with Barkatullah University
- New Projects
- Know-how Transfer of Deflouridation of Drinking Water using Nanoadsorbent based Domestic filter
- Hybrid Green Composite Materials Product Launching
- Jigyasa Program
- Skill Development Program
- One-Day Program on Vigilance and Tendering Process
- Scientific Hindi Workshop
- Vigilance Awareness Week
- Staff News



Institute - Industry Integration - 2018

CSIR - AMPRI, Bhopal, IWST and IPIRTI, Bangalore have developed several technologies for manufacturing advanced materials using agro-industrial wastes, natural fibres and polymer as hybrid green composite materials. These composite materials are stronger, durable, environment friendly, cost effective and have ample scope for variety of applications in building construction and housing sector. The agro-industrial waste based polymer composite materials are stronger than natural wood, synthetic wood, and plastic, in terms of its quality and cost effectiveness. The innovative composite materials can be used for variety of applications such as doors, false ceilings, roofing, flooring, partition and furniture.



Release of proceedings of III-2018

In this context, an INSTITUTE - INDUSTRY INTEGRATION (III-2018) workshop was organized on January 19, 2018 at IWST, Bengaluru to ease the commercialization of recently developed innovative technologies. The III-2018 was organized by CSIR-AMPRI, Indian Plywood Industries Research & Training Institute (IPIRTI) and Institute of Wood Science and Technology (IWST), Ministry of Environment and Forest, GoI leading to create more business opportunities for existing industries, start-up industries, entrepreneurship as well as a sustainable source of income to the society. About 85 delegates from industries (wastes producers & users), entrepreneurs, startups, wood and composites

manufacturers, architects, builders and user agencies participated in this event.

The program was inaugurated by the chief guest, Mr. Darpan Jain, Commissioner for Industrial Development & Director of Industries & Commerce, Govt. of Karnataka. Mr. Jain, in his address, expressed that III-2018 is a unique platform to bring lab research into industrial applications to benefit the society. He proposed few very important schemes such as (i) Set-up incubation facilities for the mentoring startups, (ii) Creation of a cluster development program, (iii) providing marginal monetary assistance for mentoring program, (iv) Skill development program, (v) Identification Geo-indicator resources and requested the



**Dr. Avanish Kumar Srivastava,
Director, CSIR-AMPRI addressing the gathering**

R&D institutes and industries to address these challenges for which he would extend financial and all other needful supports.

The guest of honour, Dr. K. Muraleedharan, Director of CSIR-Central Glass and Ceramic Research Institute, Kolkata, in his address, conveyed to industries to come up with their specific challenges which can be resolved by R&D institutes. Mr. Anil Uppin, Managing Director, Karnataka Council for Technological Upgradation, in his address, emphasized that there is huge availability of agro wastes (mainly paddy and maize waste) in the state and urged R&D institutes and industries to come up with innovative and sustainable solutions for utilization of these wastes.

AMPRI Signs Agreement with Barkatullah University

CSIR - AMPRI and Barkatullah University, Bhopal have entered into an agreement on January 25, 2018 for enhancing science environment in the country. The area of mutual interest involves Applied Chemistry, Chemo – Information, Civil Engineering, Computer Engineering, Bioscience & Environmental Science, Applied Physics & Nanotechnology, Electronics and Communication, Remote Sensing, Electrical Engineering, Mechanical Engineering, Robotics and Rural Technology. The understanding also has component of exchange of faculty, skill development activities, students exposure. Further, it also includes joint research project proposals, organization of Seminars/ Symposia / Conferences etc.

New Projects

1. Fabrication of high performance piezoelectric nano – generators – DST/Inspire Faculty Award
2. Feasibility studies for characterization and application potential of Fly ash generated at M/s Bharat Oman Refineries Limited, Bina, Distt. Sagar (M.P.) - Bharat Oman Refineries Limited, Bina, Distt. Sagar (M.P.)
3. Leachability study of Fly Ash dumping site and its impact on water and soil quality of the surrounding region of M/s Bharat Oman Refineries Limited, Bina, Distt. Sagar (M.P.) - Bharat Oman Refineries Limited, Bina, Distt. Sagar (M.P.)
4. Performance evaluation of effluent treatment plants of staple fibre division and chemical division of M/s Grasim Industries Limited, Birlagram, Nagda, M.P. - Grasim Industries Limited, Birlagram, Nagda, M.P.
5. CSIR Integrated Skill Initiative Program – CSIR
6. Development of Artificial Intelligence (AI) controlled linear displacement actuator(LDA) based on thermo – responsive smart materials (SMAs/SMPs)' SMAILDAS' – CSIR

During the program Dr.Avanish Kumar Srivastava, Director, CSIR-AMPRI; Mr. Surendra Kumar (IFS), Director, IWST; Dr. B.N. Mohanty (IFS), Director IPIRTI also spoke on the importance of III-2018. They emphasized that there is a need of interface between institutes and industries for effective re-use of industrial wastes, agro-wastes and realization of all recent technologies of all three institutes by industries is expected to result in new class of advanced composites to the society contributing to Make in India, Clean India and Skill India Mission programmes. Also, they have stated that these technologies would lead to employment & income generation both in rural and urban areas.

Scientists from CSIR-AMPRI, IWST and IPIRTI delivered presentations of readily marketable technologies of respective institutes. This includes CSIR-AMPRI technologies- Hybrid green composite materials from industrial wastes, Geo-polymer concrete & Radiation shielding materials and Aluminium foams for transportation and construction sector.

The event oversaw a very fruitful panel discussion chaired by Dr. N. Gopalakrishnan, Director, CSIR-CBRI during which several constructive ideas and dialogues were exchanged. Dr. Gopalakrishnan stated that there are several marketable technologies available in CSIR system and requested industries and delegates to visit and realize optimum benefits.

The delegates from industries stressed for development of technologies that have lower cost and reduced carbon footprint. There was mutual consensus on integration of R&D, regulatory network, government support, acceptability by the industry, incentives to entrepreneurs and startups so that innovative technologies can quickly reach out the industry and society. To introduce any new technologies to industry or society, it was felt that connecting R&D institutions with industry under Government schemes was found very important for actual speedy implementation and optimum mutual benefits.

An exhibition was organized on the occasion in which technologies of all the three institutes were showcased.



Know - how Transfer of Defluoridation of Drinking Water Using Nanoadsorbent Based Domestic Filter

CSIR –AMPRI, Bhopal transferred the technology of nanoadsorbent based Fluoride and Arsenic removal from drinking water to M/s MW Social Enterprises Private Limited, Indore on January 01, 2018. Long term consumption of water containing excessive fluoride causes fluorosis, that affects teeth, bones, joints and ultimately leads to crippling of the body. Similarly, consumption of high arsenic contaminated water results in arsenicosis, that start cancerous effect to skin and other soft organs in the human body. More than 100 million people are suffering from fluorosis and arsenicosis problems in different parts in India. Many technologies have been developed for the treatment of drinking water, but none could solve this problem for providing safe drinking water at household level. CSIR-AMPRI is working on the development of nanoadsorbent based filter useful for arsenic and fluoride removal at household level and has developed this technology successfully. After technology transfer it is expected that millions of life will be saved from fluorosis and arsenicosis problems.

The developed nanoadsorbent based defluoridation domestic filter can work without electricity with 1 - 3 liter per hour filtration rate. Methodology based on nanocoating for the incorporation nanoadsorbent into the sediment removal filter is a new concept in order to provide simple filtration device at household level. CSIR – AMPRI has also succeeded the synthesis of low cost nanoadsorbent (~600 INR/kg). Because of regeneration quality of the nanoadsorbent, fluoride and arsenic adsorbed saturated filter can be regenerated three to four times. This will reduce the treatment cost substantially. After three times regeneration, treatment cost of water is estimated to be around 15-20 paisa/lit for fluoride removal and 4-5 paisa/lit for arsenic removal. The treatment cost of higher



Transfer of Technology

fluoride (3 ppm and above) and arsenic (50 ppb and above) containing water may increase in the same ratio further depending on total dissolved solid and pH of water. The developed filter is user friendly as one has to simply pour contaminated water in the overhead tank attached to nanoadsorbent containing filters and get fluoride/ arsenic treated water from the outlet of the filter. Treated water is free from any secondary contamination and maintain all desirable minerals of water as per BIS.

At the outset of the function, Dr AK Srivastava, Director, CSIR – AMPRI, Bhopal highlighted the achievements of the Institute. He said that AMPRI will be putting every effort for dissemination of its technologies to the users. Dr. I.B. Singh, the inventor of the technology, presented the salient features of the technology.

Sh. Mankaj Kumar Singh, Director, MW Social Enterprise Pvt. Ltd. in his address said that AMPRI has an understanding of technology and expressed happiness over this collaboration.

Dr. S.K.S. Rathore, Sr. Principal Scientist proposed the vote of thanks.

Hybrid Green Composite Materials Product Launching

A new class of hybrid green composite materials were launched to the society on January 29, 2018 at CSIR - AMPRI, Bhopal in the presence of Prof. Vikram Kumar, Hon's Professor, IIT, Delhi and former Director of SSPL(DRDO) and Director, CSIR-NPL New Delhi, Dr.Avanish Kumar Srivastava, Director, CSIR – AMPRI, Bhopal and Shri P.R. Chauhan, the CEO of M/s. Sidhhi Poly Matrix, Maharashtra.

In the programme, at the outset Dr.Avanish Kumar Srivastava welcomed the guests and highlighted the event. Prof. Vikram Kumar in his address appreciated the technology and congratulated AMPRI on the occasion. Shri P.R.Chouhan highlighted the qualities of the product. Dr. P. Asokan, Sr. Principal Scientist, AMPRI proposed the vote of thanks.

CSIR- AMPRI, Bhopal has developed a new class of hybrid green composite material, which is free from termite, fungus, insects, corrosion, fire and moisture attack. The major raw materials required for manufacturing these materials are natural fibres, polymer and industrial waste particulates such as marble wastes or thermal power plant fly ash or aluminium industry bauxite residues.

The innovative composite materials have showed variety of applications potential for use as doors, false ceiling, floors tiles, wall tiles, partition and furniture. As compared to teak wood, the hybrid green composite materials are almost four times stronger and about 40% cheaper in price. These are highly durable, environment friendly and have ample scope for use in variety of multifunctional applications in housing, construction and civil infrastructure. Realization of this technology is expected to contribute to Make in India, Clean India, Skill India Mission Programmes followed by creating employment and income.

With the directives of Government of India and the Director General, CSIR, this technology now has overcome all issues pertaining to weight, price, aesthetics and other properties and is ready for commercialisation



The Product Launching

internationally. It is a wonder material to replace teak wood, natural wood, synthetic wood such as MDF, particle board, new wood and ply wood.

The hybrid green composite technologies have been licensed recently to three industries on non exclusive basis in India namely: (i) M/s. Siddhi Poly Matrix, Maharashtra, (ii) M/s. VSM Industries, Gujarat and (iii) M/s. Eco-Bright Sheet Co. Pvt. Ltd., Bhilai, Chhattisgarh for commercial production. One of the industries, M/s. Siddhi Poly Matrix, Chandrapur, Maharashtra has started the production on commercial scale. The other industries are setting up the commercial plants and commercial manufacturing is expected soon.

The materials have showed superior performance than conventional plywood in terms of mechanical strength, glue adhesion, finishing and other relevant properties and attract more industries for commercialisation. As per BIS guidelines (BIS IS:303:1989), the test results showed that the CSIR-AMPRI hybrid green composites absorb less than 0.3 % moisture and resist and avoid fungus, termites and insects attack, whereas commercially available wood and synthetic wood absorbs 5-15 % moisture. The mechanical strength of the material is also far better than the traditional materials. Apart from performing complete tests at CSIR-AMPRI, Bhopal, all these tests have been validated by a third party (Cali Lab, Bhopal) on the guidance of BIS authority.

Jigyasa Program

As a significant milestone event, Council of Scientific and Industrial Research (CSIR) has signed a Memorandum of Understanding (MoU) with Kendriya Vidyalaya Sangathan (KVS) on 06 July 2017 to launch "Jigyasa" programme in the gracious presence of Hon'ble Minister of HRD and of Hon'ble Minister for Science & Technology and Earth Sciences, and Environment, Forest and Climate change. Jigyasa envisages a wide ranging Scientist - Students Connect programmes as per various models proposed in the MoU.

A School Connect programme was organised at pilot scale during the summer vacation period (May - July, 2017) for a period of 3-5 days. The success of this programme has given a significant impact on the students and teachers. As a result, CSIR and KVS signed a MoU targeting at enhancing 'Scientific Temper' of the school children. The programme has also received positive response from highest leadership for its "Scientific Social Responsibility".

The aim of this MoU is to connect CSIR Institutes with School Students to develop 'Scientific temper' in the young minds. The scientific temper define as a mechanism wherein students' capabilities to use scientific methods which include questioning, observing physical reality, testing hypothesizing, analysis, and communicating are enhanced. This will help in nurturing scientific quotient of the students.

The scope and models of management of Jigyasa are CSIR Foundation Day, Environment Day, World Health Day, National Science Day, International Day of Chemistry, National Technology Day, Lab Specific activities/ Onsite experiments, Visits of scientists to Schools/Outreach Programme, KVs Hosted within CSIR, Popular Lecturer Series/ Demonstration Programme at School, Student Apprenticeship Programme, Science Exhibitions, Project of National Children's Science Congress, Science and Maths Club, Scientists as Teachers

and Teachers as Scientists, Teachers Workshop, Students Residential Programmes, Publication of Student Articles in CSIR Journals, Summer Vacation Programmes etc..

Apart from other regular events, AMPRI organised special lectures and workshop as follows-

Popular Lectures

- Dr. S. K. Sanghi, Senior Principal Scientist and Dr. J. P. Shukla, Principal Scientist delivered lectures at Kendriya Vidyalaya N0.1, Bhopal on November 17, 2017. Mr. Saurabh Jaitly, Principal welcomed both the Scientists. Dr. Sanghi gave lecture on the topic of "Lab on a Chip". Dr. Shukla has highlighted the future scope, opportunities and carriers in the field of science.
- Dr. J. P. Shukla, Principal Scientist and Dr. Satanand Mishra, Scientist delivered lectures at Kendriya Vidyalaya N0.2, Bhopal on November 17, 2017. Mr S. K. Pathak, Principal welcomed both the Scientists. Dr. Shukla delivered lecture on the topic of "Sustainable Water Resources Management". Dr. Mishra has highlighted the future scope, opportunities and carriers in the field of science and also about Jigyasa.
- Dr. N. Sathish, Senior scientist and Dr. Satanand Mishra, Scientist delivered talks at Kendriya Vidyalaya N0.3 on January 12, 2018. In the talk Dr. N. Sathish explained different technologies of 3D printing and various materials available for 3D printing. Students also learned about building own 3D printer and the resources available to carry out such works. Dr. Mishra highlighted the future scope, opportunities and carriers in the field of science and also about Jigyasa programme.

CSIR - Advanced Materials and Processes Research Institute, Bhopal

Science Teachers' Workshop At CSIR - AMPRI Two-days Science Teachers' Workshop was organised in CSIR - AMPRI, Bhopal during December 20-21, 2017. Kendriya Vidyalaya's Science Teachers from Bhopal, Guna, Dewas, Amla, Ujjain, Raisen, Vidisha, Ratlam, Itarsi, Mandsaur, Gwalior, Khandwa, Pachmarhi, Mhow, Barwaha, and Neemach districts of Madhy Pradesh participated in the workshop.



Director, AMPRI giving away the certificate



The participants of the workshop

Skill Development Program

A Skill development program has been taken up by CSIR - AMPRI under the flagship scheme of the Ministry of Skill Development and Entrepreneurship. The aim of this program is to enable a large number of Indian youth to take up industry relevant skill training that will help them in securing a better livelihood. To fulfill the same, AMPRI has started with 10 skill programs to make the youth friendly with processing industries and techniques involved.



A view of the program

The different training programs are - CNC Turning, Heat Treatment of Steel and Aluminum Alloys, Metallographic Polishing and Characterization, Mechanical Testing, Surface Modification for Improved Life and Performance of Components, Rapid Prototyping of 3D Design/ Modelling, Introduction to Engineering Drawing, Electroplating, Data Entry Operator and Watershed Management.

CSIR - AMPRI, Bhopal has undertaken skilling/ training programmes under CSIR Integrated Skill Initiative, which are Fee based, sponsored by industry/ Govt, etc. During 2017-18, a total of 173 candidates have been trained.

One - Day Program on Vigilance and Tendering Process

A one – day program on Vigilance and Tendering Process was organized by CSIR – Human Resource Development Centre, Ghaziabad at CSIR – AMPRI on March 21, 2018. At the outset Sh. Y Ramakrishna, Sr. Controller of Administration welcomed the guests. Dr. Avanish Kumar Srivastava, Director, CSIR – AMPRI highlighted the importance of such programmes on vigilance. Dr. Nadir Sheikh, Principal Scientist, CSIR – HRDC, Ghaziabad underlined the objective of the workshop. Lectures were delivered by Sh. K.S. Samarendranath, Formre Director, Ministry of Steel and Sh. Sanjay Aggarwal, Director, Procurement Policy, Ministry of Finance, Department of Expenditure on Conduct Rules and Public Procurement. Sh. R.N. Waghmare, Administrative Officer proposed the vote of thanks.



The workshop in progress

Scientific Hindi Workshop

A scientific workshop in Hindi was organised on March 27, 2018. Director, CSIR – AMPRI, Dr. Avanish Kumar Srivastava was the Chief Guest at the function and Dr. SAR Hashmi, Sr. Principal Scientist chaired the Technical Session. At the outset Dr. Manisha Dubey, Hindi Officer underlined



The workshop in Progress

the objectives of the workshop. In his address Dr. Avanish Kumar Srivastava underlined the responsibilities of the scientists to disseminate the results of their work to the masses in Hindi. He said that it is more convenient to work in our own mother tongue.

Dr. Rupa Dasgupta presented paper on “CSIR – AMPRI ka aakaar smriti padarth ki or prayas”, Dr. Dipti Mishra presented paper on “Geopolymeric padarthon ka rasayan vigyan”, Dr. Manoj Kumar Gupta presented a paper on “Bahuuddeshiy anuprayogon ke liye hydrophobic piezoelectric PVDF carbon nanotubes hybrid composite foam” and Dr. Manish Mudgal, Eng. RK Chouhan, Prahlad Dubey, Abhishek Bisariya and Dr. Avanish Kumar Srivastava presented a paper on “Aluminium utpadan udyog se janit lal mrida evam tap bijali sanyantr dvara janit udan rakh dvara nirmat geopolymer binder ka vikas”

Dr. SAR Hashmi, in his address highlighted the importance of the workshop. Dr. Manisha Dubey, Hindi Officer conducted the programme and proposed the vote of thanks.

Vigilance Awareness Week

Vigilance Awareness Week was celebrated at CSIR – AMPRI, Bhopal during 30.10.2017 to 04.11.2017. Oath was administered to the staff members. Essay and Slogan competitions for the staff members and debate competition for school students were organized on this occasion. The staff also undertook e-pledge. Shri Pankaj Jha, DGM (Vigilance), Bharat Heavy Electricals Limited, Bhopal was the Chief Guest at the valedictory Function. He made a presentation on the Vigilance Awareness and gave away the prizes to the winners of the competitions.

Staff News

Deputation Abroad- Dr. J.P.Shukla, Principal Scientist visited China to attend the Environment Care Consortium Meeting jointly organized by Hebei University, China and University of Birmingham, UK during March 23 – 26, 2018.

New Joining- Ms. Seema Bisht joined as Junior Secretarial Assistant(G) on 26.03.2018.

Resignation- Shri Anand Vinod Deshmukh resigned from the post of Junior Secretarial Assistant (G) on January 31, 2018.

Ph. D. Awarded to AcSIR Students

1. Ms. Rainy Gupta, Chemical Sciences awarded Ph.D. on “Development of advanced hybrid organic-inorganic geopolymeric materials for coating applications” under the guidance of Dr. S.S. Amritphale & Dr. Murari Prasad
2. Ms. Pooja Bhardwaj, Chemical Sciences awarded Ph.D. on “Development of advanced phosphatic geopolymeric multi functional materials under the guidance of Dr. Deepti Mishra and Dr. Manish Mudgal



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