भारतीय प्रौद्योगिकी संस्थान गुवाहाटी
Indian Institute of Technology Guwahati
www.iitg.ac.in

IIT Guwahati 1994 - 2019 25 years

vijñapti

The Monthly Newsletter of IIT Guwahati

Volume II, Issue VIII, August 2020

74th Independence Day celebration at IIT Guwahati

New Education Policy: A transformational reform-based approach to education and skill development for the New India

The National Education Policy (NEP) 2020 launched on 29 July 2020 is a long awaited reform process that has envisioned major progressive and futuristic reforms in the education sector with an aim to transform India into a knowledge hub and leapfrog the country towards a modern 21st century society. The efforts of the entire panel headed by Dr. K. Kasturirangan is highly admirable in framing this policy which takes into account every fundamental aspect of education right from the elementary school till the doctorate degree and the transformational vision it inculcates. The reforms announced as part of NEP2020 policy includes modifying the complete methodology of student education, the education providers and opening up the entire sector to foreign players. The most important thing is multi-disciplinary approach proposed with increase in focus on learning, skills, research, and innovation. The key would be implementation plan with well-defined actions. Although the impact is unlikely to be felt in the immediate future, there is expected to be a major revolution in the next five years with the introduction of multidisciplinary education options. This NEP2020 is also likely to attract lot of investment in education sector, improve the ailing infrastructure, increase opportunities in higher education for India's youth and increase enrolment of foreign students in India thereby benefiting the economy in the long run and hence bringing prosperity in the society.

The NEP2020 document is comprehensive and it has incorporated employability skills as well in the transformed four-year curriculum such as emphasis on communication, online pedagogies and new learning methodologies, creativity among students and problem-solving ability, lowering the stakes of board exams thereby significantly reducing the stress levels, while ensuring that the ethos of Indian Philosophy are taught to the students right from an early. The new policy suggests imparting skill-based education to increase employability among youth. As per the new rules, the school curriculum will be reduced to core concepts and there will be an integration of vocational education from Class VI. It has brought the flexibility to choose subjects from different streams. This means that an ARTS student has flexibility to choose mathematics along with other humanities subjects or a science student can choose to study history, which was not possible earlier. The incorporation of sustainable development goals set by the united nation as part of education system is another notable development for educating the future generation on sustainable aspects of living. These significant policy initiative will provide the required balance between the modern education system and traditional knowledge to the approximately 35 million school children across the nation and additional ~14 million college students, ensuring that there is no compromise on the quality and value based education, as the country moves forward to fulfil the aspirations of its future generation. Plans to allocate up to 6% of GDP on education is another major decision that will have massively infuse the necessary funding and transform the overall education sector providing much needed stimulus to modernize the present overstrained system and attract the best brains across the world back to the country and spur the pace of imparting quality education. Additionally, the decision to permit top foreign universities to establish campuses in the country brings enormous opportunities for aspiring students to avail the best education without crossing borders, while top institutes and universities across the globe will be able to enroll the best brains of the country and also partner with the finest higher education institutes in India on large educational and technological projects, set-up campuses, offer joint programs and provide world-class education within the country and provide a massive push to drive India on the top of the world education map. With the inclusion of regional languages in schools, students will be well versed with their mother tongue and NEP provides an opportunity to instruct students in their own language enabling students to grasp difficult concepts easily.

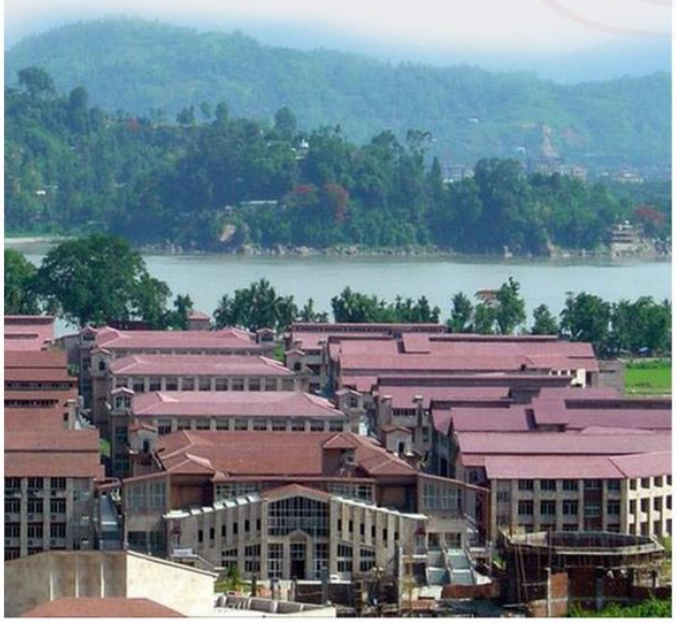
Furthermore, the announcement of setting up of a National Research Foundation is a remarkable step that is likely to provide a major boost to improve the quality of research across all the Universities in India which in turn will be further boost up the overall quality of education by facilitating modern infrastructure development and practical approach to learning. This will also ensure that students are provided exposure to state-of-the-art laboratory environment, field training and gain hands on experience for using modern instruments and involve in practical challenges thus having a larger pool of trained human resources. Overall these visionary step of NEP are very futuristic and will have a positive impact on higher education in India.

The introduction of four-year UG degree programs with provision of multiple entry and exit options, abolishing the M.Phil. degree since practical / research component is going to be an integral part of most courses, are all attempts to align with the universal trend and to ensure that a broad knowledge base is acquired in any particular professional course. Integration of vocational and professional education, holistic multidisciplinary education system with an option of choosing desired subjects or skill enhancement courses, including vocational subjects, by the students at any given point of time of the course, retaining girls and students from other socio-economically disadvantaged groups, health and healthcare based education, are all part of the salient features of these reforms. Overall, this option of flexibility in the NEP will make a positive impact on higher education in India. Further, NEP has also allowed imparting basic schooling in mother tongue with the introduction of subjects such as coding right from class 6, doing away with the strict demarcation among previously offered subjects of Science and Arts and those included compulsorily as part of curricular or extra-curricular subjects. These initiatives may help prepare students from an early age for skill development to compete in their chosen profession across the world. Additionally, use of mother tongue as a language of instruction in schools may help the students overcome the barrier of communication and enable easier learning. Such practice of imparting education in mother tongue has already been practiced in most East Asian and European countries

(Including Scandinavia) where early schooling is normally in their mother tongue and yet these countries have the best education systems. If these countries have established a strong model for education rooted to their language and culture why not us?

Overall, these comprehensive reforms of the New education policy were long awaited and are likely to transform India into a Global education and research hub within the next few years. These reforms in their very essence are meant to benefit the students, provide them with more professional opportunities for quality education and skill development, train the human resources including teachers and ensure transparency and inclusivity. These reforms are futuristic and would propel the aspirations of millions to access quality education and bring in professionalism among the youth. Being part of the higher education system and always looking at opportunities to enhance opportunities for the students and empower the youth, I believe that this policy is likely to bring in synergy in curriculum across all levels of education and I look forward to the successful implementation of the NEP intently, so that the potential of our country as a leading destination for knowledge is realized. NEP is set to create an education system that will transform India, providing high-quality learning experience to all, and thus making the country a global knowledge superpower.

Prof. T. G. Sitharam, Director, IIT Guwahati



IIT Guwahati, in collaboration with Imperial College London, develops nanoparticle 'meta-grid' to boost the overall performance of LEDs

Guwahati, India, and Imperial College London, UK, have developed a tailored 'meta-grid' of nanoparticles that could make light-emitting diodes (LEDs) brighter, energy-efficient and durable. 'Meta-grid' or 'metamaterial grid' is a specifically patterned array (grid) of nanoparticles acting as metamaterials, capable of exhibiting extraordinary optical properties.

In today's world, LEDs are deployed almost everywhere — from traffic lights to backlighting for electronic displays, smartphones, large billboards, decorative lightings, water purification, and decontamination of infected surfaces. An increase in LED light output would significantly reduce energy needs on a large scale, and therefore, will contribute towards curbing global warming and climate change.

Over the years, a significant research drive towards this objective is in exploring new materials for LED-chip encapsulation, mostly by deploying either higher refractive index glasses or epoxy materials incorporated with filler powders or nanoparticle-loaded-epoxy or engineered epoxy resins, etc. However, these techniques either makes the LED chips bulkier or their fabrication becomes more challenging and less economically viable for mass production.

Towards this goal, Dr. Debabrata Sikdar, Assistant Professor, from IIT Guwahati, along with Prof. Sir John B. Pendry and Prof. Alexei A. Kornyshev from Imperial College London, has developed a nanoparticle 'meta-grid', which needs to be placed at an appropriate location within the epoxy casing of the LEDs, for improving light output from LEDs. A 'meta-grid' is a specially-designed, optimised, two-dimensional array of specific nanoparticles, of size much smaller than the wavelength of light.

The findings have been recently published in **Light: Science & Applications** journal of the Nature Publishing Group. While prescribing minimal changes to the manufacturing process, the research team has developed this novel scheme of boosting transmission of light generated inside an LED chip across the LED-chip/encapsulant interface. This is achieved by reducing the Fresnel reflection loss at the chip/encapsulant interface, within a fixed photon escape

cone, based on tuning the destructive interference phenomena with help of the 'meta-grid'.

The technique has revealed optimal design parameters for such meta-grids to produce greater light output over any narrow/broadband emission spectrum, besides boosting LEDs' lifetime by eliminating heating of the chip from unwanted reflections within the chip.

The technique is deployable by itself or in combination with other existing techniques applied for increasing LED's efficiency. The entire original theoretical framework needed for the invention has been developed in-house and is rigorously tested against standard commercial simulation tools. The research team plans to fabricate a prototype device within one year and corroborate their theoretical predictions with experiments.

The theoretical models, developed by Dr. Sikdar and his collaborators, allow finding out the optimal conditions for the design of the nanoparticle 'meta-grid' layer. Material and composition of nanoparticles and parameters, such as their sizes, average interparticle spacing and the distance from the surface of the LED chip, are optimised to achieve the maximum enhancement in light extraction from the LED chip into its encapsulating casing, over any emission spectral range of a typical LED.

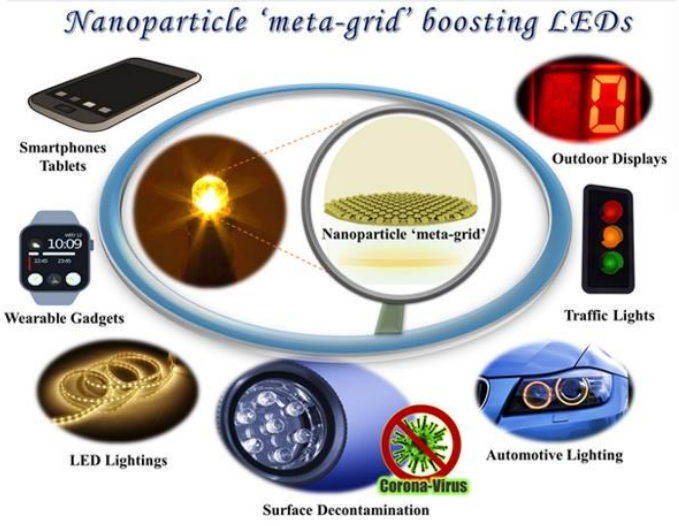
Speaking about the merits of their 'meta-grid' scheme for LED light enhancement, Dr. Debabrata Sikdar, Assistant Professor, Department of Electronics and Electrical Engineering, IIT Guwahati, said, "With the continuous advancement in nanofabrication technology, it is now possible to fabricate metallic nanoparticles which are mostly monodisperse or having a very narrow spread. Still, there could always be some randomness in particle size and/or position, flatness of grid, and variation in refractive index due to fabrication error or material defects, which are unavoidable. Effects from most of these inaccuracies can be estimated from our tolerance study and it has shown the robustness of our scheme".

Dr. Sikdar further added, "In this invention, the effects of the 'meta-grid' on the standard commercial LEDs, based on group III–V materials are demonstrated. However, the proposed concept of enhancing light transmission from an emissive layer to its encapsulant casing can be extended to other types of light emitting devices hosting an emissive-layer/ encapsulant interface. Generally, our nanoparticle 'meta-grid' scheme for enhanced light extraction could potentially cater to a wider range of optical gadgets, not just semiconductor LEDs."

Speaking about the work, Prof. Alexei A. Kornyshev, Department of Chemistry, Imperial College London, stated, "There could be different engineering solutions for the meta-grids in the LED-chips. One of them would be to use drying-mediated self-assembly of nanoparticles, e.g. made of silver or alternative less-lossy plasmonic materials capped with appropriate ligands, to form free-standing the Sikdar–Premaratne–Cheng 'plasmene' sheets. Those nanoparticle monolayer sheets could be made stretchable for precise tuning of the interparticle separation and then stamped on the LED chip before the encapsulating casing is fabricated. The spacing between the 'meta-grid' and the LED chip surface can be controlled via the thickness of the plasmene's substrate".

Talking about their work, Prof. Sir John B. Pendry, Department of Physics, Imperial College London, said, "The simplicity of the proposed scheme and the clear physics underpinning it should make it robust and, hopefully, easily adaptable to the existing LED manufacturing process. It is obvious that with larger light extraction efficiency, LEDs will provide greater energy savings as well as longer lifetimes of the devices".

The research team believes that the work will definitely have a global impact on the versatile LED based applications and their multi-billion-dollar market worldwide.



IIT Guwahati and RR Animal Healthcare successfully manufactured and commercialised the indigenously developed COVID-19 diagnostic kits

Indian Institute of Technology Guwahati and RR Animal Healthcare Ltd. have been successful in jointly developing and delivering large quantities of affordable COVID-19 related diagnostic kits. With this initiative, IIT Guwahati has become the first institute in the country to demonstrate an efficient model to develop import-substitute COVID-19 kits from lab-scale to prototype level, field/hospital testing and commercialising thereby saving valuable foreign exchange for the country, timely delivery and customising as per the needs of the user. These kits, being developed presently at the Center of Nanotechnology, IIT Guwahati, are now supplied regularly in large quantities to the National Health Mission, Assam and several hospitals across the country.

The launch of these indigenously developed COVID-19 kits, by Minister of Finance, Health and Family Welfare, Assam Shri Himanta Biswa Sarma, was held on 18 June 2020. These included initially the ICMR approved "SPILD" Viral Transport Media (VTM) Kits. Over the past several months, with the lockdown being implemented across the country and with very less air connectivity, acquiring large quantities of COVID-19 kits became very difficult. To overcome this crisis, the National Health Mission, Assam had approached Prof. T. G. Sitharam, Director, IIT Guwahati, with a request to develop Viral Transport Media (VTM) kits, RNA extraction kits and RT-PCR kits and help the state government in their efforts to overcome this shortage. IIT Guwahati immediately took up this challenge and strategised to develop these kits in-house to meet the growing requirement of these kits during this time of COVID-19 pandemic.

Speaking about the work on these kits, Prof. T. G. Sitharam, Director, IIT Guwahati, said, "IIT Guwahati is at the forefront in the fight against COVID-19 and the Institute has remained fully committed to work with the state government during this difficult situation. The development of high-quality and affordable VTM and other COVID-19 related kits at the Institute was taken upon receiving a request from NHM, Assam and these kits have now been validated by GMCH as well as approved by ICMR".

More than 2.5 Lakhs VTM kits developed at IIT Guwahati have already been supplied to NHM, Assam. Several testing laboratories across the country have also started procuring these import substitute kits due to their high quality, affordable price and timely delivery schedules. The performance of the indigenously developed RNA extraction kits have also been highly satisfactory as per the Guwahati Medical College and Hospital (GMCH) and the Institute has started supplying these RNA extraction kits in large quantities to the state government. Similarly, the indigenously developed RT-PCR kits are being validated presently and the production, as well as supply, of these kits is likely to commence soon.

These affordable and sterile "SPILD" Viral Transport Media (VTM) kits, RT-PCR kits and RNA isolation kits have been developed at the Center for Nanotechnology, IIT Guwahati, jointly with RR Animal Healthcare Ltd. with inputs from GMCH by the research teams led by Prof. Parameswar Krishnan Iyer, Prof. Siddhartha Sankar Ghosh from IIT Guwahati and Dr. Labanyamoy Kole and Dr. Debashish Dutta of RR Animal Healthcare.

Speaking about their work, Prof. Parameswar Krishnan Iyer and Prof. Siddhartha Sankar Ghosh, faculty at the Center for Nanotechnology, IIT Guwahati, "As a premier higher education and research institute the efforts of IIT Guwahati in supporting the state government at this time of pandemic by providing various critical technologies related to COVID-19 are utmost important. When the Mission Director, NHM, Assam approached IIT Guwahati to develop these COVID-19 kits, we carefully strategised with RR Animal Healthcare to develop these "SPILD" COVID-19 kits indigenously keeping in mind the quality, affordability and timely delivery which was utmost important. Presently, we have developed the capability to deliver several thousands of these high-quality import substitute kits everyday as and when required and this can be ramped up if needed to meet the requirement of the entire country without depending on imported kits".

With the indigenous development of these "SPILD" COVID-19 kits from a laboratory level to large scale production and commercialisation capability, IIT Guwahati along with RR Animal Healthcare, who is now based at IIT Guwahati Research Park, has demonstrated that the mission to be self-reliant in healthcare products (Atmanirbhar Bharat Abhiyan) can be achieved if there is clear strategic vision.

This is also as per the idea shared by the Hon'ble Prime Minister of India, Shri Narendra Modi, who has been advocating on indigenous manufacturing. As per recent reports, the country has been importing these kits from several countries at exorbitant prices, which can now be replaced with these IIT Guwahati developed kits, thereby saving valuable foreign exchange as well as generating employment in healthcare and spurring allied healthcare product development. Furthermore, IIT Guwahati has also been successful in developing a safer version of the VTM kits, higher efficiency RNA extraction kits which are likely to be launched in the coming days.

Speaking about working together with IIT Guwahati, Dr. Debashis Dutta, Director, RR Animal Healthcare Ltd., said, "The journey of jointly developing the "SPILD" COVID-19 kits with IIT Guwahati has been very satisfactory, and is a major contribution to the nation since these high-quality COVID-19 diagnostic kits are an affordable replacement for all the imported COVID-19 kits by a huge margin. We thank the Director IIT Guwahati to allow us to be part of this exciting project and the invitation to jointly produce them at the Research Park, IIT Guwahati".

Speaking about the work with the Institute, Dr. Labanyamoy Kole, Head, Research and Development, RR Animal Healthcare Ltd, said, "The entire team at RR Animal Healthcare and IIT Guwahati has been very com mitted to providing an affordable and high-quality health solution at this time of pandemic and we will keep improving and customising these kits such that their quality remains the best while ensuring the development and timely delivery of these kits so that the nation does not rely anymore on imported products."

IIT Guwahati has now been manufacturing large quantities of "SPILD" VTM kits, "SPILD" RNA extraction kits and "SPILD" RT-PCR kits jointly with RR Animal Healthcare Ltd. at the Institute, and these kits are indispensable to confirm the presence or absence of COVID-19, which until now were being imported. The Institute is ready to work with Government of India, National Health Missions as well as Hospitals and testing centers across the country for the large scale production and supply of all these kits to meet their immediate requirement.

Indigenously developed COVID-19 diagnostic kits

IIT Guwahati and RIKEN-Japan collaborates to find a new way to separate chiral molecules

What is a Chiral molecule?	Researcher says
Chiral enantiomers are chemicals that have the same molecular formula but different three-dimensional arrangement of the constituent molecular segments. The separation of enantiomers is significant in the biomedical field because many biochemically active chemicals are found as mixtures of two enantiomers, one of which may be beneficial and the other, toxic.	Prof. Achalkumar explains the importance of this work by reminding us of a tragic event that shook the world in the 1960's, when, a large number of babies were born with severe deformities because the mother was prescribed a drug called 'thalidomide' for morning-sickness. "The problem was a result of the consumption of two enantiomers without separation. One of the isomer was toxic, while the other was the drug"

Researchers from the Indian Institute of Technology Guwahati and RIKEN, Wakoshi Campus, Japan, have developed a simple method to separate chiral enantiomers – chemicals that have the same molecular formula but different three-dimensional arrangement of the constituent molecular segments. The separation of enantiomers is important in the biomedical field because many biochemically active chemicals are found as mixtures of two enantiomers, one of which may be beneficial and the other, toxic.

The group of researchers is led by Prof. A. S. Achalkumar, Department of Chemistry, IIT Guwahati, and Prof. Yasuhiro Ishida from RIKEN, Wakoshi Campus, Japan. Their path-breaking work has recently been published in the prestigious journal, Nature Communications. The paper has been coauthored by Prof. Achalkumar, Prof. Ishida, Dr. Vakayil Praveen, Senior Scientist, CSIR-National Institute for Interdisciplinary Science and Technology and research scholars Dr. Krishnachary Salikolimi, Ms. Kuniyo Yamada, and Dr. Noriko Horimoto.

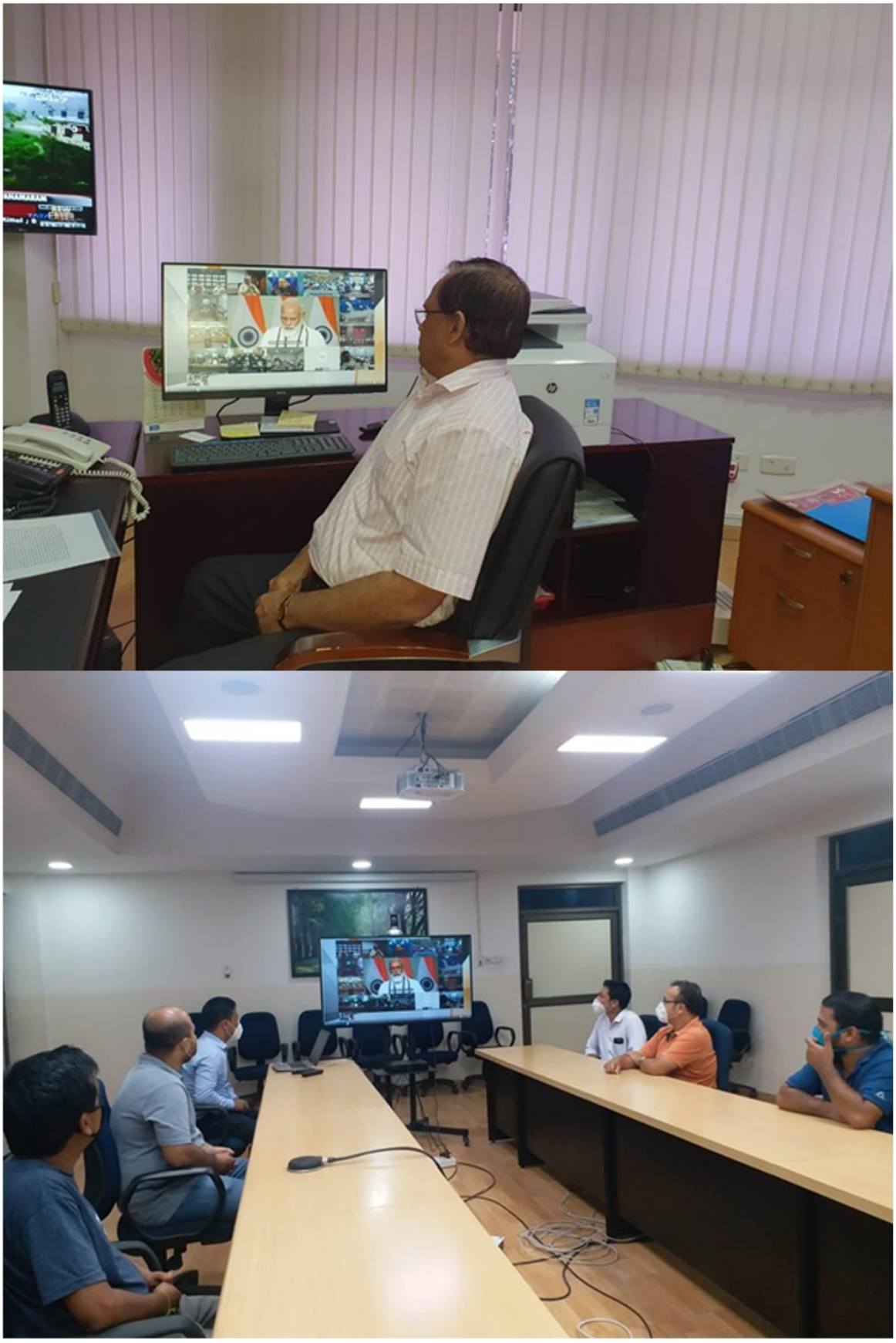
Prof. Achalkumar explains the importance of this work by reminding us of a tragic event that shook the world in the 1960's, when, a large number of babies were born with severe deformities because the mother was prescribed a drug called 'thalidomide' for morning-sickness. "The problem was a result of the consumption of two enantiomers without separation. One of the isomer was toxic, while the other was the drug", says the researcher.

The chemical properties of enantiomers are similar, which makes it very difficult to separate them, or to synthesize specifically one without being contaminated from the other enantiomer. "Nature is master in the exclusive production of enantiomerically pure amino acids and sugars, but man is still trying to master the art of enantioselective synthesis", says the lead researcher from IIT Guwahati. The current method to separate enantiomers is by chromatography, which is slow, energy intensive, and requires environmentally harmful solvents.

The researchers from IIT Guwahati and RIKEN have developed a novel approach to separate enantiomers with the use of helical supramolecular polymers. The helical polymers are formed by the salt formation of aromatic carboxylic acid and chiral amino alcohols. In this simple one-pot process they could resolve racemic mixtures into materials rich in one isomer. The interaction sites in the supramolecular polymer not only helps in the connection of the monomers but also in the recognition of chiral guests. When two salts with the same chirality are mixed, they undergo copolymerization and became soluble, while those with opposite chirality do not form copolymer and hence precipitate. The precipitated compound can be separated easily. The present system can be used for the enantioseparation of the abundant class of chiral amino alcohols, which has huge commercial potential."

Prof. Ishida adds that although many supramolecular polymers are known, their enantio-separation ability has never been investigated so far. "Development of such process may help in reducing the price of chiral active pharmaceutical ingredients (APIs) and finally that of the medical treatment, itself. In addition such process can be extended to other classes of chiral molecules", he says.

Indian Institute of Technology Guwahati Faculty Prof. Mihir Kumar Purkait has been awarded the Abdul Kalam Technology Innovation National Fellowship by Indian National Academy of Engineering (INAE).



Inauguration Session of NEP Conclave on Transformational Reforms in Higher Education under National Education Policy 2020

Flood relief camp organized by students of IIT Guwahati in association with Students' Gymkhana Council -IIT Guwahati's Social Service Club, IITG.

The team of students from IIT Guwahati had covered around 700 families with approximately more than 3500 people, in 5 districts of Assam, which include Morigaon, Barpeta, Nalbari, Baksa & Darrang district.

IIT Guwahati commenced its initiative- "Sahabhagi" with distribution of essential food items, mask among 150 families residing just outside its campus. These families were hampered by the prolonged lockdown & a bout of flood.

Prof. T. G. Sitharam, Director, Prof. Sashindra K. Kakoty, Deputy Director, Dr. S. M. Suresh, Registrar, IIT Guwahati, faculty members and the officials of the institute participated in the event.

A flood relief camp was organized on 22nd August 2020 at Bihapara and Bordoloimari village near Rangia. The drive targeted 150 affected families. The volunteer team led by Mr. Hemanta Baruah, PhD scholar, Centre for Linguistic Science & Technology, IIT Guwahati, also delivered awareness talk on menstrual hygiene and social distancing norms to prevent COVID 19.

Indian Institute of Technology Guwahati
Guwahati - 781039
Assam, India

https://www.facebook.com/iitgwt/
https://twiteer.com/IITGuwahati/
https://www.linkedin.com/school/iitg/
https://www.instagram.com/iitgwt/

VIJNAPTI, the monthly Newsletter of Indian Institute of Technology Guwahati is published by the Public Relation, Branding and Ranking Office, IIT Guwahati, Guwahati - 781039, Assam, India, (Email: peeroff@iitg.ac.in, Phone +91-361-2584000)