

# The Institution of Engineers (India)

.....ENGINEER'S

VOICE.....

## FARIDABAD LOCAL CENTRE

**"A Century Of Service to the Nation"**

Estd 1920

Issue – April 2023



Dear Engineers,  
Greetings to all of you,

I would like to extend my sincerest gratitude to all the members for successful release of 1st IEI News of Faridabad Local Centre. I Convey my warmest greetings and Congratulations and look forward for your active participation.

With Best Wishes – Er. K.R Gupta, FIE, Chairman

### CHAIRMAN'S MESSAGE

### FROM HONORARY SECRETARY'S DESK



**Technical Activities Conducted by Faridabad Local Centre during the 4<sup>th</sup> Quarter  
January to March 2023 :-**

1. Technical Lecture Meeting on Corporate Sustainability/ESG Strategy on 7<sup>th</sup> January 2023
2. Technical Lecture Meeting on Applications of Artificial Intelligence in present Era on 18<sup>th</sup> February 2023
3. World Engineering Day on 4<sup>th</sup> March 2023
4. International Women's Day on 10<sup>th</sup> March 2023
5. World Water Day on 25<sup>th</sup> March 2023

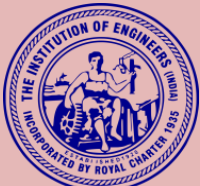
**Technical Activities to be held in 1<sup>st</sup> Quarter 2023-24 April to June 2023 :-**

1. Technical Lecture Meeting on 22<sup>nd</sup> April 2023
2. All India National Webinar on Advanced material, synthesis, characterization and application on 29<sup>th</sup> April 2023
3. World Technology day on 11<sup>th</sup> May 2023
4. World Telecommunication & Information Society Day on 17<sup>th</sup> May 2023
5. World Environment Day on 5<sup>th</sup> June 2023
6. Technical Lecture Meeting on 10<sup>th</sup> June 2023

Corporate Members are requested for their Contribution towards the Institution of Engineers (India) by way of Articles, Advertisements and Donation etc.

**Bank Details : The Institution of Engineers (India), SB A/c No. 146601000016741  
Indian Overseas Bank, Sector-6 Faridabad, (IFSC Code : IOBA001466)**

Er. Inderdeep Singh Oberoi, FIE  
Honorary Secretary



# The Institution of Engineers (India)

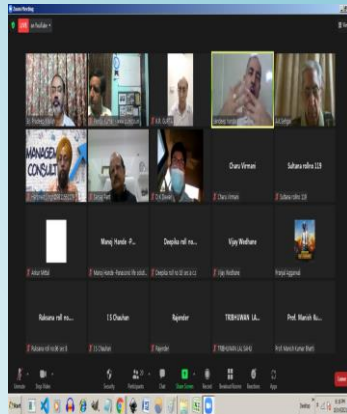
## FARIDABAD LOCAL CENTRE

2<sup>nd</sup> Floor, Bank Building, J.C. Bose University of Science & Technology (YMCA),

Sector – 6, Faridabad, 121006 Haryana, Tel: 0129-2245008, 9810118362,

Email: [faridabadlc@ieindia.org](mailto:faridabadlc@ieindia.org) : Website : [www.ieifbdlc.org](http://www.ieifbdlc.org)

# Technical Activities Conducted by IE (I) Faridabad Local Centre



## Technical Lecture Meeting

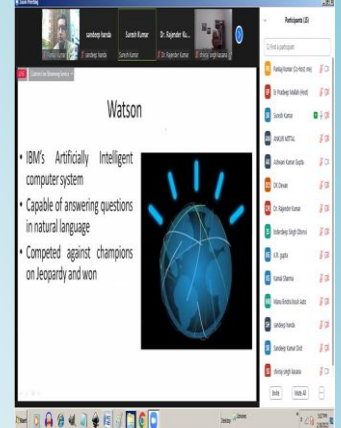
The Institution of Engineers (India), Faridabad Local Centre organized a Webinar on “Corporate Sustainability/ESG Strategy” on 7<sup>th</sup> January 2023 through digital medium- Zoom App. The event started at 4.30 PM. The Welcome address was delivered by Er. Kuldip Raj Gupta, Chairman IEI FBD LC. The event started by lighting of the lamp of knowledge digitally.

### Excerpts of deliberation: Er. Saumyaditya Bose

What does a business leader/manager need to know to action a corporate sustainability/ESG strategy in their company?. Corporate sustainability is about more than just protecting the environment, although that is core to this approach. A sustainable business is one that works in step with societal and environmental goals, rather than at odds with them.

Corporate sustainability is a business strategy for long-term growth that works in harmony with people and the planet.

There are three pillars of corporate sustainability: The Environmental Pillar, which includes strategies to eliminate and offset greenhouse gas emissions, use green energy, eliminate toxic hazards, reuse or recycle materials and manage waste, reducing the carbon footprint throughout the value chain.



## Technical Lecture Meeting

The Institution of Engineers (India), Faridabad Local Centre organized a Technical Lecture Meeting Webinar on “Application of Artificial Intelligence in present in Era.” on 18<sup>th</sup> February 2023 through digital medium- Zoom App. The event started at 4.30 PM. The Welcome address was delivered by Er. Kuldip Raj Gupta, Chairman IEI FBD LC. The event started by lighting of the lamp of knowledge digitally.

### Excerpts of deliberation: Dr. Suresh Kumar Turing Test for Intelligence

- A computer can be considered to be smart only when a human interviewer, “conversing” with both an unseen human being and an unseen computer, can not determine which is which.

### Objections to the TT

- **The Theological Objection** "Thinking is a function of human's immortal soul. God has given immortal soul to humans, but not to any machine. Hence no machine can think."
- **Mathematical Objections** There are a number of results of mathematical logic that can be used to show that there are limitations to the power of discrete state machines.

## IE(I) FLCC MEMBERS BIRTHDAYS COMING SOON



**27<sup>th</sup> May 2023**  
Er. K.R Gupta, FIE  
Chairman  
IE(I) FBD L.C



**4<sup>th</sup> June 2023**  
Er. Mohan Lal, MIE  
FLCC Member  
IE(I) FBD L.C



**4<sup>th</sup> June 2023**  
Er. K.K Narula  
FLCC Member  
IE(I) FBD L.C

*May each day in your life be full of health, wealth & happiness*



# Technical Activities Conducted by IE (I) Faridabad Local Centre



## World Engineering Day

The Institution of Engineers (India), Faridabad Local Centre organized a Technical Activity World Engineering Day for Sustainable Development in association with NorthCap University Gurugram on 4<sup>th</sup> March 2023 (Saturday) through Hybrid mode Virtually & physically. The event started at 11.00 AM. The Welcome address was delivered by Er. Sandeep Handa, FIE Immediate Past Chairman, IEI FBD LC. The event started by lighting of the lamp of knowledge digitally.

### **Excerpts of deliberation: Dr. Dr. S.K. Agrawal** **Sustainable Life in AI-Metaverse**

Metaverse refers to a virtual world that exists parallel to our physical reality, where people can interact with each other and digital entities in real-time.

Artificial intelligence (AI), the metaverse is becoming more sophisticated and realistic, and it offers tremendous opportunities for individuals and businesses to create sustainable lifestyles.

### **Sustainable Life in AI-Metaverse Impact Environmental Sustainability:**

Optimize energy usage and reduce carbon emissions, making it an eco-friendly alternative to traditional physical spaces. Reduce our carbon footprint and promote a more sustainable way of living.

### **Virtual Social Interaction:**

Provide people with an entirely new way to interact socially. With AI-powered avatars and virtual environments, people could connect with each other in ways that are not possible in the physical world. New opportunities for communication and collaboration, fostering a sense of community and shared purpose.



## International Women's Day

The Institution of Engineers (India), Faridabad Local Centre organized a International Women's Day in association with MRIIRS University Faridabad on 10<sup>th</sup> March 2023 (Friday) through Hybrid mode Virtually & physically. The event started at 11.00 AM. The Welcome address was delivered by Er. Inderdeep Singh Oberoi, FIE, Honorary Secretary, IEI FBD LC. The event started by lighting of the lamp of knowledge.

**Honorary Secretary, Er. I.S Oberoi, FIE** delivered welcome address and made aware the gathering about need of the topic for discussion and highlighted importance of International Women's Day.

Briefed about the history of IEI and also informed about the various activities undertaken by IEI for technical awareness and also collaboration

### **Panel Discussion- I**

- Participants discussed their journey and also shared motivational concepts with the audience and the delegates.
- The concern regarding fewer women in STEM was also recognised and the panel experts advised the present delegates to venture into technical areas.

### **Keynote Speaker- Dr Sarita Ahlawat, M.D Bot-Lab, Dynamics**

- Dr. Sarita discussed about their journey as a start up company venturing into Drone manufacturing in collaboration with IIT, Delhi.
- The journey included starting from one drone to now planning to have 7200 drones flown all together at one time.

# Technical Activities Conducted by IE (I) Faridabad Local Centre



## Technical Activity Report of “World Water Day”

The Institution of Engineers (India), Faridabad Local Centre organized a Technical Activity World Water Day on 25<sup>th</sup> March 2023 (Saturday) through Hybrid mode Virtually & physically. The event started at 4.30 P.M. The Welcome address was delivered by Er. Kuldip Raj Gupta, FIE Chairman, IEI FBD LC. The event started by lighting of the lamp of knowledge.

**Chairman Er. Kuldip Raj Gupta, FIE** delivered welcome address and made aware the gathering about need of the topic for discussion and highlighted importance of World Water Day “Global Campaign theme: Be the change you want to see in the world”

**Excerpts of deliberation: Er. I.S Chauhan, FIE**

### **ACCELERATING CHANGE “WATER REVOLUTION” CRISIS OF WATER IN INDIA**

- Worldwide 2.2 billion people living without access to safe water, hosting 18% of world population. While India has 600 million (50% of population) According to the World Water survey facing acute shortage of water,.
- 31% of Indians have been in a situation where it was unsafe to drink water but had to consume it given no other choice and thereby suffered from water-borne diseases such as diarrhoea and gastroenteritis and hepatitis.
- The Government of India estimates that 70 per cent of available water is unfit for consumption without prior treatment. The WRI research also shows that 54 per cent of the nation is facing high to extremely high water stress and this is only bound to get

This year's World Water Day theme, "Accelerating Change," emphasizes the urgent need for individuals, communities, and institutions to take responsibility for bringing about meaningful change. To accelerate change, we must all play our part by changing our water consumption and management practices. This is a once-in-a-generation opportunity for the world to unite around water, and we must seize it.

### **Water Management Measures contd..**

- Improving infiltration using urban run-off (i.e. permeable pavement).
- Providing infiltration & bio-retention (urban green spaces).
- Purifying wastewater & alleviating flooding (healthy wetland).
- Water harvesting.
- Hybrid solutions that contain built elements that interact with natural— features and seek to enhance their water related ecosystem services
- Connecting rivers to floodplains & aquifers.
- Forest landscape restoration to reduce flood impacts ,stabilising slopes— & providing clean water
- Conserving— & protecting water sources (i.e. protected areas)
- Establishing flood bypasses to reduce downstream flooding



# IE(I) FLCC Members Contributions

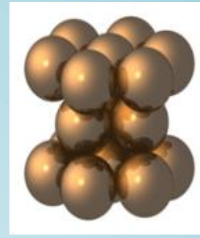
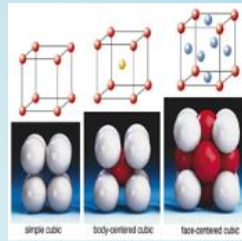
## Birds Eye View of Engineering Materials

By Dr. S. S. Kasana, FIE

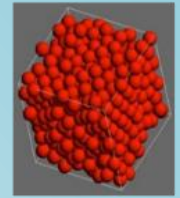
Technical Advisor( Advanced Materials) Star Wire (I) Ltd.



Periodic Table of the Elements																						
GROUP		I																VIII				
1A																		2				
1	H																	He				
2	Li	Be															B	C	N	O	F	Ne
3	Na	Mg															Al	Si	P	S	Cl	Ar
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr				
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe				
6	Cs	Ba		Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn				
7	Fr	Ra																				

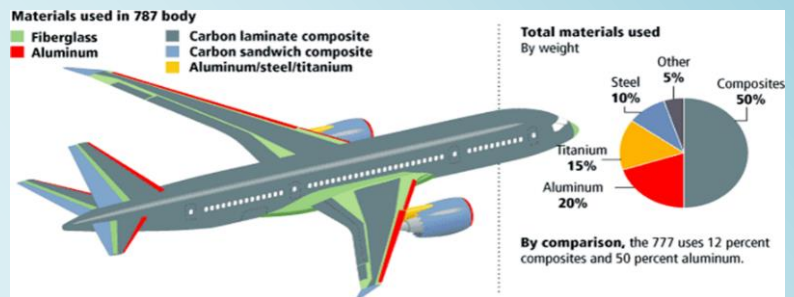
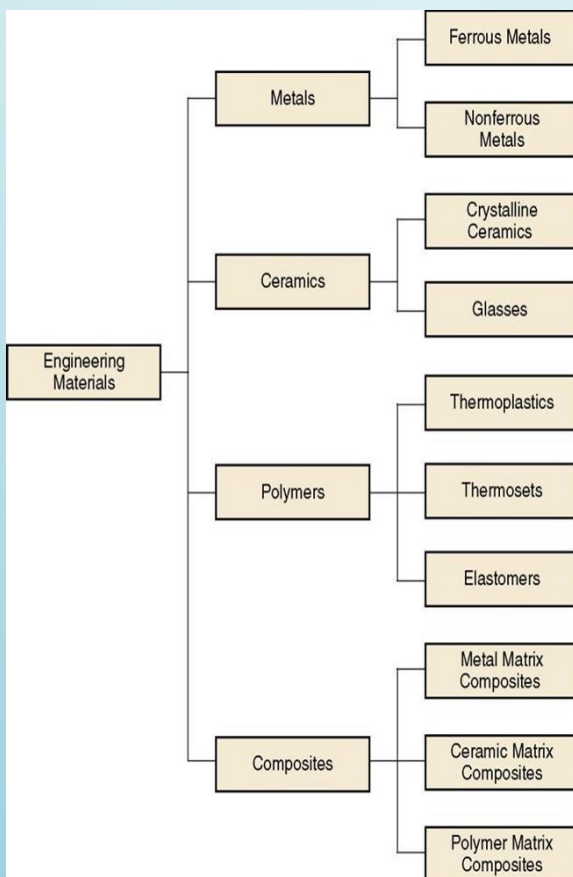


hexagonal close-packed



Crystalline Material

Non-Crystalline/  
Amorphous Material





## IE(I) FLCC Members Contributions

### Advanced Tool for Green and Energy Efficient Building Design



Er. Ankur Mittal, FIE

Current projections indicate that 66 percent of the world's population will live in cities by 2050. Population equivalent to 7 (seven) "New Delhi" size cities is added per year to world's urban population. According to the data published by The Energy and

resources Institute (TERI), urban share of GDP in India will rise to 75% in 2030-31. Buildings represent around 40% of world's primary energy consumption. They are, therefore, directly responsible for increase in greenhouse gases and can play a key role in climate change adaptation. To achieve an energy efficient building regime, governments, businesses and individuals must transform the way buildings are designed, built and operated. Energy efficient buildings (new constructions or renovated existing buildings) can be defined as buildings that are designed to provide a significant reduction of the energy need for heating and cooling, independently of the energy and of the equipments that will be chosen to heat or cool the building. The area of study is to develop understanding of high performing building envelope and drive adoption of energy efficient built to investigate and quantify the energy impact from the expected proliferation of important energy efficient solutions.

Heating, Ventilation and Air Conditioning system (HVAC) are energy guzzlers in any air conditioned commercial building. The purpose of a HVAC system is to create a comfortable environment by adjusting the four parameters of indoor air - temperature, humidity, air flow, and cleanliness, for the person inside the room/facility or product/process to meet requirement. Another high energy consuming section in building is lighting systems. Lighting not only provide a basic visual environment for occupants, but also have a significant impact on human health, work efficiency, and building energy consumption. Today, many people spend most of their day indoors. Therefore, it is important to create a comfortable visual environment to improve the living environment of the occupants and improve the efficiency of work.

Indoor environmental quality (IEQ) is the quality of a building's environment directly linked to health and comfort of occupants using that space. IEQ is determined by many factors including lighting, air quality, and damp conditions. Indoor environmental quality (IEQ) is a general indicator of the quality of conditions inside a building.

It can also include functional aspects of space, for example whether the layout provides access to equipment when needed and whether the building has sufficient space for its occupants. In this regard it is necessary to address for thermal comfort, visual comfort and air quality etc. and their role in IEQ improvement.

## IE(I) FLCC Members Achievements



Er. J.P. Malhotra, FIE

Rtn. Shri J.P. Malhotra, FIE President DLF Industries Association, CMD Bhartiya Valves Pvt. Ltd. Was presented FMA Award of Excellence for Industry Academia Collaboration by FMA given away by Lt. Gen EK Anand Director General & Dean FMS, MRIIS

### FMA Awards JP Malhotra DLFIA

Sanjay Kumar  
info@impressivetimes.com

**FARIDABAD :** Rtn. JP Malhotra FIE President DLF Industries Association, CMD Bhartiya Valves Pvt. Ltd. was presented FMA Award of Excellence for Industry Academia Collaboration by Faridabad Management Association given away by Lt. Gen EK Anand Director General and Dean FMS MRIIS and Dr. Aqul Busrui, Vishal Lalani, Govind Negi (FIE Success) joined by President FMA, Ms. Saloni Koul, Sr. VP FMA, Sh. Subhash Jagota and Ms. Charu Smita Malhotra Gen. Secy FMA at National Management Day Celebration held on Feb 24, 2023. The FMA Excellence Award was conferred upon Sh. JP Malhotra



for his outstanding and contribution for Industry Academia Collaboration spread over two decades. The Award citation said that he has been working in close collaboration with prestigious academic institutions and schools like Manav Rachna, DAVIM, Lingaya's, ITS, Sharda University, Satyga Darshan University, YMCA,

conducting skill development programs & mentoring students, propagating industrial visits & interaction of students with industry/Mr. JP Malhotra the Chairman Bhartiya Yuva Shakti Trust Faridabad and engaged in creating job providers. Only Recently under his leadership, DLF Industries has been selected by Govt. of India/

Govt of Haryana under World Bank Project for implementation of STRIVE Project. He has authored 2 books & has received numerous awards for his contributions to the MSME sector, notably National Award for Outstanding Small Scale Entrepreneur for the State of Haryana by President of India. Mr. Malhotra has been associated

THE FMA EXCELLENCE AWARD WAS CONFERRED UPON SH. JP MALHOTRA FOR HIS OUTSTANDING AND CONTRIBUTION FOR INDUSTRY ACADEMIA COLLABORATION SPREAD OVER TWO DECADES.

with Institution of Engineers and Bhartiya Yuva Shakti Trust for creating employable youth thus building entrepreneurs who can give employment to couple of youth. Mr. JP Malhotra was complemented and congratulated by Lt. Gen VK Anand, Governing Body members of DLF Industries Association, Friends from Industrial Fraternity, Rotary Club of Faridabad Midtown, BYST, Radio Manav Rachna and host of dignitaries present on the occasion.

### DLF Industries Association selected for STRIVE Project #JP Malhotra

Deepti Arora

info@impressivetimes.com

**FARIDABAD:** DLF Industries Association thanks Govt of Haryana for selection of DLF Industries Association as industry cluster by under STRIVE Project by Govt. of India implemented by Govt of Haryana said Mr. JP Malhotra President DLF Industries Association. It is a unique golden opportunity for Industry all to get trained manpower at a minimal or no cost. Association will conduct orientation, awareness and Training seminars to popularize benefits of Apprenticeship, provide high quality training, for company supervisors and staff, undertake capacity building by training managers, supervisors and members besides train apprentices under STRIVE said Mr. JP Malhotra President DLF Industries Addl Director (Deptt. Skill Development and Industrial Training Govt of Haryana) Sh. Sanjeev Sharma who visited office of DLFIA with his officer to assess the preparedness of our Industry Cluster and the training infrastructure @IAPDC. Sh. Sanjeev Sharma had in depth discussion with Sh. JP Malhotra Sh. Vijay Raghavan and cluster incharge Ms. Sonia Chouhan and gave excellent guidance for a



result oriented Industry Cluster activities. The object of STRIVE is to work on capacity Building and creating awareness of Apprenticeship and the message should be sent to all the members of the Association. Sh. Sanjeev Sharma appreciated the action taken by IC so far and assured his fullest guidance and support for Implementation of the STRIVE Project. We at DLF Industries Association under the able guidance of (Deptt. Skill Development and Industrial Training Govt of Haryana) Director Sh. Sanjeev Sharma have submitted Industrial Apprenticeship Initiative Plan to Govt of Haryana. We propose to establish and organise skill training and upgradation in four Trades. We plan to pick up 20 boys and girls/ per year in each trade for thenext 15 months. The Scheme is funded

by World Bank and DLF Industries Association industry cluster will be sanctioned requisite funds as per norms for implementation of IAI Plan said Mr. JP Malhotra President DLF Industries Association joined by Sh. Vijay Raghavan Gen. Secretary. More than 30 Cluster Members and officers of ITI/ DLFIA were present. Such is novelty of STRIVE that its objective is to train Supervisor, Manager of Member Companies who have to ultimately train the Apprentices so that they become productive asset to the Company. To be eligible for stipend and absorption of Apprentices, Industry has to be encouraged for registration of our Strive Cluster members under NAP's portal. We shall mobilise candidates from local ITI, also from Govt or private Collages.



Er. Sushil Bajaj, MIE

Received an architecture and interior design excellence award 2023 North India. at Taj Westend Bangalore. The programme is online on you tube





# IE(I) FLCC Members Achievements



Dr. Rajender Kumar, MIE  
MRIIRS University

Dr. Rajender Kumar has received certificate for ZED ASSESSOR under the ZED MSME Scheme an Initiative by Quality Council of India, GoI. He is also certified professional for green and eco movement by Asocham



Er. I.S Chauhan, MIE

Our Faridabad Local Centre Executive body member Er. I.S. Chauhan has been elected as Governing Council Member in Indian Association of structural Engineers for the term 2023-25.



Felicitated to Dr. Sushil Kumar Tomar, Vice Chancellor, J.C Bose University of Science & Technology (YMCA) Faridabad by Er. Inderdeep Singh Oberoi, FIE, Honorary Secretary & Er. Sandeep Handa, FIE Immediate Past Chairman IE(I) Faridabad Local Centre



Felicitated to Dr. M.K Soni, Pro Vice Chancellor, Lingayas University Faridabad by Er. Inderdeep Singh Oberoi, FIE, Honorary Secretary & Er. K.K Narula, FIE, Past Honorary Secretary IE(I) Faridabad Local Centre



Mr. Sonu Kaushik

Our office Executive Mr. Sonu Kaushik has done extreme efforts for IEI Faridabad Local Centre Membership growth and Conversion. His Birthday fall on 10th June 2023. We wish him all the best and success in life

## Research & Development

The Faridabad Center has started the R&D Cell, which will be beneficial for the advancement of engineering and nation building. The cell has already started its activity & all meetings are being recorded in the activity register. Er. Pankaj Kumar, Er. Mohan Lal Bharti, Er. Ankur Mittal, Er. IS Chauhan, Er IS Oberoi and Er. Pankaj Shrivastav are contributing in initiation phase & activities till now are being recorded.

Engineering students will also get involve in the next phase. Senior practising Engineers will be assigned soon as mentors to them. They will help them in engineering practices, Industry visit, Project preparation and more.

## Research & Development

We invite  
Engineering  
students and  
Practicing  
Engineers

To be a part of  
R&D  
Activities  
Registration

Free

all Stream



The Institution of Engineers (India), Faridabad Local Center  
Address : 2nd Floor, Bank Building, JC Bose University, Sector 6, Faridabad

## Technical News

### Team uses natural catalysts to develop low-cost way of producing green hydrogen



Experts from Swansea and Grenoble have joined forces to develop a practical way to produce green hydrogen using sustainable catalysts.

The researchers now hope their work will be a major step towards making green hydrogen production simpler, more affordable and more scalable.

Dr Moritz Kuehnel, senior lecturer in Swansea University's chemistry department, said: "In our work we use natural enzymes -- hydrogenases -- to generate green hydrogen using sunlight. Unlike synthetic catalysts which are based on precious metals like platinum, hydrogenases contain only earth-abundant elements such as iron and nickel. However, these enzymes are very sensitive and quickly deactivate when exposed to air, making their practical use near impossible."

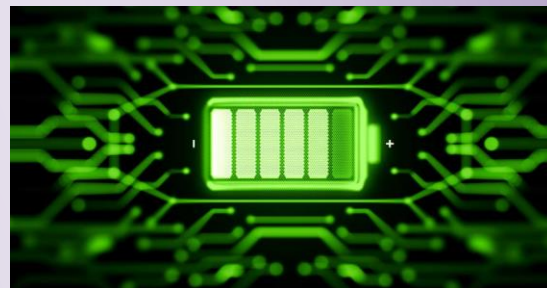
The team now has developed engineered solvents which enable hydrogenases to function in air. Simply placing them in these solvents instead of water makes them more active and more stable, so that they can be practically used in air to generate hydrogen.

Dr Christine Cavazza, senior scientist at CEA Grenoble, added: "We integrated synthetic nanoparticles with natural enzymes into so-called hybrid materials, which combine the best of both worlds to achieve new, superior functionality. TiO<sub>2</sub> nanoparticles are excellent at using sunlight to generate charges and hydrogenases are extremely efficient in using these charges to generate green hydrogen.

"Combining the two therefore allows for the efficient generation of green hydrogen from sunlight, something none of the separate components are capable of."

The research brought together Swansea University expertise in photocatalysis, solvent design and its focus on delivering practical solutions to complex problems and combined this with knowledge of extracting natural enzymes and utilising them for renewable energy conversion at the Alternative Energies and Atomic Energy Commission (CEA) and Université Grenoble Alpes (UGA).

### New invention: The oxygen-ion battery



Lithium-ion batteries are ubiquitous today -- from electric cars to smartphones. But that does not mean that they are the best solution for all areas of application. TU Wien has now succeeded in developing an oxygen-ion battery that has some important advantages. Although it does not allow for quite as high energy densities as the lithium-ion battery, its storage capacity does not decrease irrevocably over time: it can be regenerated and thus may enable an extremely long service life.

In addition, oxygen-ion batteries can be produced without rare elements and are made of incombustible materials. A patent application for the new battery idea has already been filed together with cooperation partners from Spain. The oxygen-ion battery could be an excellent solution for large energy storage systems, for example to store electrical energy from renewable sources.

Ceramic materials as a new solution : "We have had a lot of experience with ceramic materials that can be used for fuel cells for quite some time," says Alexander Schmid from the Institute for Chemical Technologies and Analytics at TU Wien. "That gave us the idea of investigating whether such materials might also be suitable for making a battery."

The ceramic materials that the TU Wien team studied can absorb and release doubly negatively charged oxygen ions. When an electric voltage is applied, the oxygen ions migrate from one ceramic material to another, after which they can be made to migrate back again, thus generating electric current.

"The basic principle is actually very similar to the lithium-ion battery," says Prof. Jürgen Fleig. "But our materials have some important advantages." Ceramics are not flammable -- so fire accidents, which occur time and again with lithium-ion batteries, are practically ruled out. In addition, there is no need for rare elements, which are expensive or can only be extracted in an environmentally harmful way.



### Ultrasound device may offer new treatment option for hypertension



Experts from Swansea and Grenoble have joined forces to develop a practical way to produce green hydrogen using sustainable catalysts. The researchers now hope their work will be a major step towards making green hydrogen production simpler, more affordable and more scalable. Dr Moritz Kuehnel, senior lecturer in Swansea University's chemistry department, said: "In our work we use natural enzymes -- hydrogenases -- to generate green hydrogen using sunlight. Unlike synthetic catalysts which are based on precious metals like platinum, hydrogenases contain only earth-abundant elements such as iron and nickel. However, these enzymes are very sensitive and quickly deactivate when exposed to air, making their practical use near impossible."

The team now has developed engineered solvents which enable hydrogenases to function in air. Simply placing them in these solvents instead of water makes them more active and more stable, so that they can be practically used in air to generate hydrogen.

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The collaboration came about as the result of Swansea's strategic partnership with UGA. The researchers' findings have just been published by international journal *Angewandte Chemie*.

Green hydrogen is needed as a fuel for the decarbonisation of transportation -- especially HGV, long-haul aviation, the marine sector where electrification is not viable -- as well as the chemical industry, especially fertiliser production, and for the energy sector. However, the costs of producing green hydrogen currently limit its use on a large scale which is why this research is so significant for the future.

Using sustainable catalysts such as hydrogenases instead of expensive platinum can lower the cost of electrolyzers and fuel cells, making green hydrogen cheaper to produce and to use. It also lowers dependence on imports which can be disrupted by external factors.

### Join IEI Membership

**Come to mainstream with your fellow professionals to be a part of National Engineering Excellence, Engineers of all disciplines are requested to take Membership of The Institution of Engineers (India).**

For details contact:

**IE(I) Faridabad Local Centre at [faridabadlc@ieindia.org](mailto:faridabadlc@ieindia.org) or visit our website at [www.ieifbdlc.in](http://www.ieifbdlc.in).** We operate from 2<sup>ND</sup> Floor, Bank Building, J C Bose University of Science & Technology, Sector-6, Faridabad-121006, Ph. 01292245008; Mob. +919810118362; +918168484512; +918053266743