Department of Mechanical Engineering

Technical Magazine

ACADEMIC YEAR 2024-2025 EVEN SEMESTER

Issue 2 (May 2025)

Prof. V.Sureshkumar M.E

Assistant Professor (Sl. G)
Head of the Department

"Established in 2009, Mechanical Engineering stands as a cornerstone of engineering education, known for its versatility and profound impact across industries. This discipline is rooted in the study, design, and advancement of mechanical systems and technologies, continually evolving to meet the needs of a rapidly changing world. The Department of Mechanical Engineering—one of the institute's earliest and most respected departments—was founded with a clear vision: to cultivate technically skilled, innovative, and confident graduates. With a commitment to academic excellence and practical relevance, the department empowers students to address complex real-world challenges and contribute meaningfully to global progress."

VISION

To endeavor the excellence in Mechanical Engineering by producing competent and confident graduates to face the future challenges.

MISSION

DM 1: Provide transformative education and improve students' skills to face the global challenges in Mechanical and Allied Engineering.

DM 2: Nurture innovation, attitude, creativity, core competency and serve the society through innovative solutions and products.

DM 3: Inculcate real world challenges, emerging technologies and endeavor the students to become entrepreneurs or employable.

Program Educational Objectives – PEOs

PEO I: Graduates shall excel in the field of design, thermal, materials and manufacturing, as successful engineers or researchers or as entrepreneurs.

PEO II: Graduates will analyze problems, design solutions and develop products as a team member in advanced industrial projects.

PEO III: Graduates shall have professional ethics, team spirit, life-long learning, good oral and written communication skills and adopt corporate culture, core values and leadership skills.

Program Specific Outcomes – PSOs

PSO1: Professional skills: Students shall understand, analyze, design and develop integrated equipment, thermal devices and composite components manufacturing.

PSO2: Competency: Students shall qualify at the State, National and International level competitive examination for employment, higher studies and research.

Program Outcomes - POs

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Message from Editorial Team

"Innovation thrives where curiosity meets dedication. In this issue, we explore breakthrough ideas and transformative efforts across industries. Whether you're just starting out or looking to elevate your expertise, we invite you to engage, reflect, and grow with every page."

– Editorial Team

"Design is more than aesthetics—it's how we connect ideas with people. As you flip through this issue, let each element of design enhance your understanding and appreciation of the stories we tell."

– Design Team

Chief Editor:	Prof V.Sureshkumar, HoD/Mech
Faculty Advisors:	Prof O. Sathish, AP/Mech,
	Prof P. Sathish, AP/Mech,
	Prof B. Sudhakar, AP/Mech,
Student Editors:	Mr.C. Gowtham, IV/Mech
	Mr.R. Kamesh, III/Mech
	Mr.M. Rajesh Kanna, II/Mech
Design Team:	Prof O. Sathish, AP/Mech,
	Mr.S. Santhoshkumar, III/Mech
	Mr.M. Lokesh, II/Mech

Table of Contents:

S.NO	Topics	Page No
01	**FORGING AHEAD – HOW AN AGE-OLD PROCESS STILL POWERS MODERN ENGINEERING**	01
02	**INJECTION MOLDING FOR PLASTICS MANUFACTURING**	02
03	**UNDERSTANDING PASSIVATION IN METAL TREATMENT**	04
04	**THE PICKLING PROCESS FOR CLEANING METAL SURFACES**	05
05	**OLE EVINRUDE'S OUTBOARD MOTOR REDEFINED BOATING**	07
06	**EARTH'S SECRET HYDROGEN VAULT: TRAPPED UNDERGROUND, READY TO POWER THE FUTURE**	08
07	**NO MORE NEEDLES: THIS NEW DEVICE DETECTS HEALTH RISKS FROM THIN AIR**	10
08	**CAPTURING BREATH, DETECTING DISEASE: HOW ABLE IS CHANGING THE GAME**	12

09	**NEW MATERIAL SUPERCHARGES SOLAR PANEL POWER & LIFESPAN**	14
10	**GAME-CHANGING NEW TECHNOLOGY CAN SQUEEZE HYDROGEN FROM SEAWATER**	16
11	**MIT’s SODIUM FUEL CELL POWERS PLANES, CAPTURES CARBON, AND OUTRUNS BATTERIES**	19
12	**WORLD RECORD BROKEN: NEW MATERIAL REVOLUTIONIZES ION CONDUCTIVITY**	22
13	**THIS ULTRASONIC TECH CAN CHARGE DEVICES THROUGH WATER**	25
14	**SCIENTISTS DEVELOP NEW SOLAR DEVICE THAT SQUEEZES WATER FROM AIR**	28
15	**THIS TINY CHIP SEES LIKE AN EYE, THINKS LIKE A BRAIN, AND REMEMBERS INSTANTLY**	31
16	**PRINCETON ENGINEERS DEVELOP “METABOT” THAT IS BOTH A MATERIAL AND A ROBOT**	34
17	**PRINTING THE FUTURE OF LIFE: HOW 3D COLLAGEN SCAFFOLDS GROW REAL TISSUES**	38

FORGING AHEAD – HOW AN AGE-OLD PROCESS STILL POWERS MODERN ENGINEERING

Forging is an ancient yet remarkably versatile metalworking process, dating back to Mesopotamia around 4000 BC. It shapes metals through hammering, pressing, or rolling, typically after heating them to temperatures where they become malleable.

Historically, blacksmiths utilized this method to craft tools, weapons, and agricultural implements. Modern forging, however, has evolved significantly, incorporating electrically powered presses and advanced tooling to achieve high precision, strength, and durability in manufactured parts.

Today, a variety of metals such as steel, aluminum, brass, copper, titanium, and stainless steel are commonly forged, as these metals withstand compressive forces without becoming brittle. However, materials like cast iron or high-carbon steel, prone to cracking under impact, are unsuitable. Forging provides critical advantages, including improved grain structure, superior mechanical strength, and absence of defects like porosity and cracks.

The forging process involves several key stages. Initially, dies—special molds designed for shaping—are prepared. Metal billets or ingots are then heated in furnaces to precise temperatures, often between 850°C and 1150°C for steel, making them easily deformable. Next, the heated metal is pressed or hammered into the desired shape, possibly requiring multiple passes and reheating to reach exact dimensions.

Subsequently, components undergo heat treatment such as annealing or tempering to refine mechanical properties, followed by controlled cooling to optimize strength. Final finishing steps, including machining and surface treatments, prepare the parts for industrial use.

Forging methods are classified by temperature into hot, warm, or cold forging. Hot forging, performed above the metal's recrystallization temperature, requires lower force but yields less precision and a rougher finish. Warm forging, conducted at intermediate temperatures, provides improved precision and smoother surfaces, whereas cold forging at room temperature offers high dimensional accuracy but demands significant compressive force.

Different specialized forging techniques, like drop forging (using hammer impacts), press forging (continuous pressure), upset forging (expanding bar ends), roll forging (using opposing rollers), and precision forging (near-net shapes at controlled temperatures), cater to diverse industrial needs.

Due to its reliability and strength advantages, forging remains essential across critical sectors, including aerospace, automotive, and oil and gas, for components like gears, crankshafts, valves, and bearings, continually advancing through innovative materials and simulation technologies.

– **CHANDRU B, II-YEAR/MECHANICAL**

INJECTION MOLDING FOR PLASTICS MANUFACTURING

Injection molding is a fascinating manufacturing process that helps in shaping various plastic parts used across industries. From everyday items like toothbrushes to components in the International Space Station, this technique involves injecting molten materials into a mold to form parts with precise dimensions, making it highly effective for mass production.

The process starts with creating a high-quality mold, which can significantly influence the outcome. Materials are heated and mixed in an injection unit before being injected into the mold at high pressure. This ensures the material fills and replicates the mold's intricate details. Once the material cools and solidifies, the part is ejected, often requiring some finishing touches to remove excess material. Injection molding supports a broad spectrum of materials, notably over 90,000 types of plastics, and can even work with certain metals in powdered form. Popular plastics used include polycarbonate, known for its strength and heat resistance, and polypropylene, favored for its elasticity and chemical resistance. This versatility allows manufacturers to choose materials based on the specific properties needed, such as transparency, strength, or heat resistance.

Despite its many advantages, such as low per-part costs and minimal waste production, injection molding requires a significant upfront investment. Molds and machinery can be costly, and the design and optimization of these tools take time, which can be a drawback when quick market entry is necessary.

Moreover, the process tends to be less efficient for very large parts and isn't suited for most metal components, which are better made using traditional manufacturing methods like CNC machining.

Optimizing a part for injection molding involves a few crucial design considerations. Uniform wall thickness is vital to prevent defects like warping, and incorporating features like bosses can strengthen weaker areas. Round corners help reduce stress points and lower mold-making costs, while a proper draft angle eases part removal from the mold.

Injection molding is an indispensable method in modern manufacturing, offering the ability to produce durable, complex parts at high volumes. While it comes with its set of challenges, its benefits are undeniable, making it a cornerstone of industrial production as we advance through the Fourth Industrial Revolution.

– **DHARANEESH P, II-YEAR/MECHANICAL**

UNDERSTANDING PASSIVATION IN METAL TREATMENT

Passivation is a critical process used across various industries to enhance the longevity and performance of metal components, particularly those made of stainless steel. This process involves creating a passive layer on the metal's surface to protect it against corrosion, which can significantly extend the life of metal systems and prevent costly maintenance and replacements.

The passivation process is particularly vital for materials that come into frequent contact with corrosive substances or operate in challenging environments. It involves treating the metal surface with a chemical solution that removes contaminants such as free iron and forms a thin oxide layer that acts as a barrier against oxidation and corrosion.

One of the most common materials to undergo passivation is stainless steel. Stainless steel naturally forms a chromium oxide layer when exposed to oxygen, which protects it from rust and corrosion. However, manufacturing processes like welding or machining can strip away this protective layer and expose the underlying metal to corrosion. Passivation restores this layer by cleaning the surface and allowing the metal to react with the air to reform the protective oxide layer.

The typical passivation process begins with a thorough cleaning of the metal surface to remove all contaminants, oils, and debris. This is crucial because any residue on the metal can prevent the formation of an even and effective oxide layer. The cleaned parts are then treated with a passivation solution, commonly citric acid or nitric acid. Citric acid is becoming more popular due to its safety and environmental benefits compared to nitric acid.

After treatment in the acid solution, the parts are thoroughly rinsed with water to remove any remaining chemicals, preventing further chemical reactions or damage. Following rinsing, the metal is dried and exposed to air, allowing the oxide layer to form and develop its protective properties.

This passive layer is incredibly thin and transparent and does not alter the appearance of the metal, making it ideal for applications where aesthetics are important. More importantly, it significantly enhances the corrosion resistance of the metal, ensuring that components can withstand harsh environments and corrosive substances without degrading.

Passivation is essential for industries such as aerospace, automotive, food processing, and any field that relies on durable and long-lasting metal components. By investing in proper passivation processes, companies can reduce maintenance costs, extend the service life of their equipment, and ensure the safety and reliability of their systems.

– **KRIFITH PAVITHRAN M, II-YEAR/MECHANICAL**

THE PICKLING PROCESS FOR CLEANING METAL SURFACES

Pickling is a chemical process used to clean metal surfaces by removing contaminants like rust, oxides, and stains. This method is particularly useful after hot working processes, where metal surfaces develop a discolored oxide layer. Unlike mechanical cleaning methods such as grinding or wire brushing, pickling ensures a more controlled and even removal of impurities.

The process involves immersing metal in an acid solution, typically hydrochloric or sulphuric acid, which reacts with the oxide layer and dissolves it. The metal is then rinsed thoroughly to remove residual acid, neutralized with an alkaline solution, and dried before further processing. Some metals, like cast iron and corrosion-resistant steels, require specialized acids such as phosphoric, nitric, or hydrofluoric acid for effective pickling.

Pickling is widely used in industries handling ferrous metals, copper, aluminium alloys, and even jewellery. The method enhances metal durability, improves corrosion resistance, and results in a smooth, clean surface ideal for coating or further fabrication. It is particularly essential in manufacturing processes where precise surface preparation is necessary.

Hydrochloric acid is the preferred choice for modern steel pickling due to its efficiency and ability to work at room temperature. However, sulphuric acid remains a cost-effective option, allowing for temperature-controlled pickling and easier acid recovery. Despite its advantages, pickling comes with limitations, such as hazardous waste disposal challenges and the risk of hydrogen embrittlement, which can weaken the metal over time.

The process is straightforward but requires careful handling due to the use of strong acids. Proper disposal of pickling sludge, which contains metal residues, is crucial as it is classified as hazardous waste. However, some of the waste materials can be recycled for other industrial applications, such as steel sintering.

Pickling remains a widely used surface treatment method in manufacturing, offering a reliable way to clean and prepare metal surfaces for further processing while balancing efficiency, cost, and environmental considerations.

– **LOKESH M, II-YEAR/MECHANICAL**

OLE EVINRUDE'S OUTBOARD MOTOR REDEFINED BOATING

Ole Evinrude, a Norwegian immigrant, changed the face of water transportation with his invention of the outboard motor. A device that transformed boating across America's lakes. His innovation enabled boats to move beyond the limitations of manual rowing, making water activities accessible and enjoyable for many. Recognized for his significant impact, ASME declared Evinrude's outboard motor an engineering landmark in 1981.

In the early 20th century, Evinrude was inspired to create a small marine engine following a rowing incident where he fetched ice cream for his fiancée. This led to the development of a gasoline-powered engine that was lightweight and efficient. In 1911, he and his wife, Bess, launched a 62-pound, two-cycle engine that could generate 1.5 horsepower, featuring a design that has since become standard in the industry.

The Evinrudes' business flourished quickly. Former President Theodore Roosevelt even praised the reliability of an Evinrude motor during his Amazon River expedition. However, the stress of their business's rapid growth led the couple to sell the company in 1914. Yet, Ole's passion for innovation brought him back to the industry in 1921 with a new, improved outboard motor model. This model was lighter and more powerful, sparking further advancements in marine and land equipment, including the creation of the Lawn-Boy brand.

The Evinrude legacy continued through their son, Ralph, who took over in 1934 and expanded the company, even incorporating electric vehicles. Despite facing challenges such as economic downturns and the eventual obsolescence of two-stroke engines, the Evinrude brand made a lasting impact on outdoor recreation.

Sadly, Outboard Marine, the parent company, went bankrupt, and the Evinrude brand ceased production in 2020 after more than a century. Despite this, Ole Evinrude's contributions to engineering and recreation continue to resonate with enthusiasts and historians alike.

– **RAJESH KANNA M, II-YEAR/MECHANICAL**

EARTH'S SECRET HYDROGEN VAULT: TRAPPED UNDERGROUND, READY TO POWER THE FUTURE

Scientists have discovered the ideal geologic conditions that let hydrogen form and accumulate underground, offering a cleaner energy alternative.

A ground breaking study reveals how natural clean hydrogen, buried deep in Earth's crust, could fuel a greener future.

Scientists have cracked the "recipe" for finding underground hydrogen, identifying the geological conditions that allow it to form, rise, and stay trapped until it's tapped. Like baking a perfect soufflé, it all comes down to getting the ingredients and timing just right. If harnessed effectively, this natural hydrogen could reduce our dependence on fossil fuels and power a more sustainable world.

Unlocking Earth's Hidden Hydrogen Reserves

Clean hydrogen could play a major role in building a greener, more sustainable future—and it turns out, there's plenty of it hidden deep within the Earth's crust. But locating it isn't simple. Finding the right conditions where this gas forms and survives depends entirely on the surrounding geology.

Now, a group of scientists, including experts from our Earth Sciences department, has uncovered the key “ingredients” needed to pinpoint these underground hydrogen hotspots.

This discovery could be a game-changer for identifying and tapping into naturally occurring clean hydrogen reserves.

Baking the Perfect Hydrogen Soufflé

The researchers explored how hydrogen gas is produced deep underground, how it travels through rock layers, and what allows it to become trapped in pockets, or escape entirely.

They compared the process to baking a soufflé. Just like a delicate dish that depends on precise amounts, timing, and temperature, the formation of clean hydrogen relies on getting every condition exactly right.

How Underground Hydrogen Fields Are Formed?

Clean hydrogen behaves in a similar way to other gases. Once it has been generated in the Earth’s crust, it rises towards the surface.

Along the way, it may become trapped by an impermeable layer of rock and accumulate underground, forming a gas field. It is accessed by drilling and produced from wells.

The ingredients for this “hydrogen recipe” – referred to as ‘gold’ or ‘white’ hydrogen – can be found in many different types of geological settings around the world.

Some are relatively young, just a few million years old, while others are hundreds of millions of years old.

A Cleaner Path to Powering the Planet

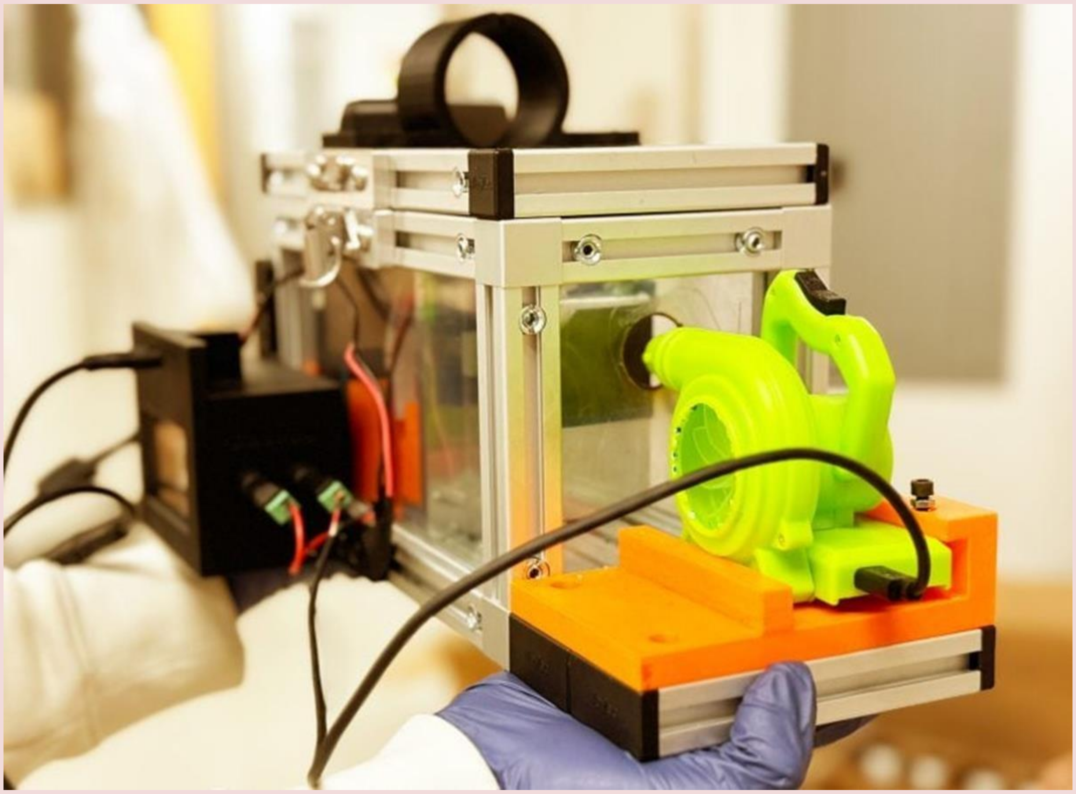
Hydrogen has the potential to power vehicles and industry, generate electricity, and heat our homes.

There are many ways to obtain hydrogen, but currently a lot of the methods are not particularly clean in environmental terms.

As this clean hydrogen is generated by the natural geochemical processes in the Earth’s crust, it could help us transition away from fossil fuels and towards a greener future.

– **RANJITH KUMAR S, II-YEAR/MECHANICAL**

NO MORE NEEDLES: THIS NEW DEVICE DETECTS HEALTH RISKS FROM THIN AIR



The device, called ABLE, is a small, portable tool designed to collect and analyze molecules from the air we breathe. It's about the size of a smartphone—just four by eight inches—but it has the potential to make a big difference in how we detect and monitor health conditions.

Right now, most medical tests rely on blood samples. That means needles, waiting rooms, and often a lot of discomfort—especially for people who need regular monitoring, like those with diabetes. But ABLE could change that. One day, it might allow people to check their blood sugar levels just by breathing into a device, or help doctors track new born health and even detect airborne viruses in crowded places like hospitals and schools.

The science behind it is impressive. Detecting molecules in the air is much harder than in liquids like blood, mostly because the molecules are so diluted. Finding one virus in a trillion particles of air is no easy task. Until now, it required huge, expensive machines. But ABLE makes this possible in a much smaller, more affordable package.

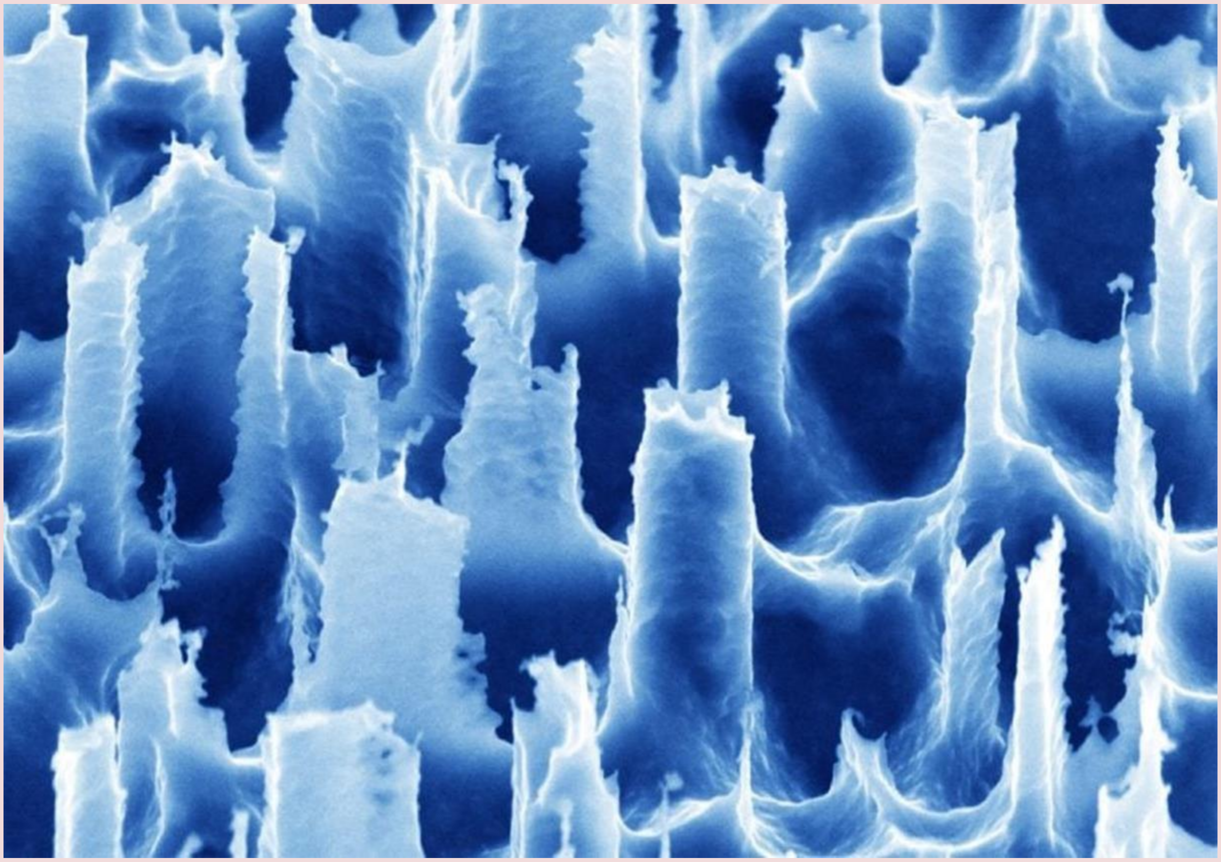
Jincheng Ma, one of the researchers, explained it best: “We have phones that take pictures and record sound, but nothing that shows us the chemistry of the air. This device brings us closer to that.”

The study, published in Nature Chemical Engineering on May 21, shows that this technology could one day lead to more comfortable, needle-free medical care—and maybe even help us respond faster to public health threats.

As a student learning about science and technology, I find it exciting to see how innovations like ABLE can turn complex lab processes into everyday tools. It’s a great reminder that the future of medicine isn’t just about what happens in hospitals—it’s also about making care easier, faster, and more personal for everyone.

– **RIZWANA K, II-YEAR/MECHANICAL**

CAPTURING BREATH, DETECTING DISEASE: HOW ABLE IS CHANGING THE GAME



Imagine diagnosing health conditions just by analyzing the air we exhale. That's the vision behind ABLE—the Airborne Biomarker Localization Engine—developed by scientists at the University of Chicago. This innovative device is designed to turn something as invisible and elusive as breath into a powerful tool for medical diagnostics.

One of the cleverest features of ABLE is a surface covered in microscopic silicon spikes, each just about 1/200th the width of a human hair. These spikes help droplets form inside the device by guiding condensation—crucial for capturing molecules suspended in the air.

Here's how the system works: first, a tiny pump pulls in air. Then, a humidifier adds water vapor, and a built-in cooling unit drops the temperature. This causes moisture to condense into droplets, which trap any important molecules or particles present in the air. These droplets slide effortlessly along the ultra-slick silicon surface and collect in a small reservoir, where they can be easily analyzed using standard liquid detection tools.

At first, the team wasn't sure whether ABLE could capture volatile molecules—those that evaporate quickly. To test this, lead researcher Jingcheng Ma ran a surprisingly simple experiment. He used a cup of coffee. After blowing vaporized coffee into the system, he could smell the coffee's signature aroma in the condensed liquid—clear proof that volatile molecules had been successfully captured.

Further testing showed impressive results: ABLE could detect glucose from breath, airborne E. coli, and even inflammation-related biomarkers from mice with unhealthy gut microbiomes.

The idea behind ABLE wasn't purely technical—it was also deeply human. Professor Bozhi Tian, one of the senior scientists, was inspired during a visit to the Stephen Family Neonatal Intensive Care Unit at UChicago's Comer Children's Hospital. There, neonatologist Prof. Erika Claud shared a common frustration: the need to draw blood from premature infants to monitor their health.

These tiny patients are among the most fragile in all of medicine. "The promise of this technology," Prof. Claud said, "is that we will be able to non-invasively track newly identified biomarkers, to optimize care for these infants."

While the current version of ABLE is already a breakthrough, the researchers are looking ahead. They hope to miniaturize the device even further, potentially making it wearable. They're also working with medical experts to identify new biomarkers that could be monitored through breath—like those linked to inflammatory bowel disease (IBD).

Beyond medical uses, ABLE might also spark new research in physics. Ma, a mechanical engineer with expertise in thermofluidics, is excited about how this system can help scientists explore how airborne impurities affect phase change behaviors—a topic with wide-reaching applications in science and engineering.

As a student, what excites me most is seeing how science, engineering, and compassion can come together in a device like ABLE. It's a reminder that innovation doesn’t just happen in labs—it happens when people imagine a better, less invasive way to care for others. And in this case, it all starts with a single breath.

– **SAKTHI KUMAR M, II-YEAR/MECHANICAL**

NEW MATERIAL SUPERCHARGES SOLAR PANEL POWER & LIFESPAN

Panels coated with the new composite absorb moisture at night and release it during the day for passive cooling.

In a major leap for renewable energy technology, researchers from King Abdullah University of Science and Technology (KAUST) have developed a new composite material that helps solar panels stay cool—increasing their power output by 12.9% and extending their lifespan by over 200%. This exciting breakthrough could change the way we harness solar energy in harsh climates.

As a student exploring innovations in sustainable energy, I was fascinated by how this material works without using any electricity—a process known as passive cooling. Traditional cooling systems rely on electricity-powered fans or pumps, which can be impractical and costly. But this new approach solves the problem in a much more energy-efficient way.

Led by Professor Qiaoqiang Gan, the KAUST research team created an acrylate-based hygroscopic composite—a material that absorbs moisture from the air at night and releases it during the day, cooling the surface of the solar panel. Made from lithium chloride and sodium polyacrylate, the composite is both cost-effective and environmentally friendly, using no harmful chemicals or complicated fabrication processes.

Their tests in the Saudi Arabian desert were especially impressive. Over several weeks, solar panels with this coating operated 9.4°C cooler than uncoated ones. This led to higher energy output and much longer operational life, while cutting the cost of electricity production by almost 20%.

Even better, the team proved the technology works beyond hot climates. Tests in rainy and cooler parts of the mainland U.S. confirmed that the passive cooling effect was consistent across different environments.

Professor Stefaan De Wolf, a leading expert in solar cell design at KAUST, provided the test solar cells. His team's work has often pushed the boundaries of solar cell performance. "This work is a great example of collaboration across specialties at KAUST," said De Wolf. "We tested the cooling material on world-class solar cells in multiple settings and consistently saw excellent results."

For anyone passionate about sustainability, this research offers hope that future solar power systems can be more efficient, longer lasting, and more affordable—simply by staying cool. And for us students, it's a perfect example of how science and smart engineering can work together to drive real-world impact.

– **ABARAKEERTHIK S, III-YEAR/MECHANICAL**

GAME-CHANGING NEW TECHNOLOGY CAN SQUEEZE HYDROGEN FROM SEAWATER

Researchers have developed a novel, scalable method to produce hydrogen directly from seawater, offering a revolutionary solution for clean energy production without desalination.

Imagine generating clean fuel not from freshwater or chemicals, but directly from seawater—without the need for costly desalination. That's exactly what researchers at the University of Sharjah have achieved with a new multi-layered electrode that could revolutionize how we think about hydrogen energy.

As a student passionate about sustainable tech, I found this research fascinating not just for its innovation but also for its real-world impact—especially for countries like the UAE, where freshwater is scarce but sunlight and seawater are abundant.

Published in the journal Small, the study outlines how this advanced electrode enables direct hydrogen production from untreated seawater—all while resisting corrosion, maintaining long-term stability, and performing at an industrial scale.

Engineering a Breakthrough

Led by Dr. Tanveer Ul Haq, the research team created a microenvironment-engineered, multilayered electrode that tackles the usual problems of seawater electrolysis, like corrosion from chloride ions. Their solution? A smartly designed surface that not only protects itself but also enhances hydrogen output.

The system absorbs seawater and initiates electrolysis without any pre-treatment—meaning no need for expensive desalination plants. The electrode's design also creates a protective carbonate layer, acting like a high-tech shield that prevents degradation and boosts efficiency.

How Efficient Is It?

The team's experiments showed impressive results:

- Hydrogen production at 1 A/cm^2 in natural seawater.
- No hypochlorite formation, which is a major issue in similar systems.
- Faradaic efficiency of 98%, meaning almost all electrical energy goes into producing hydrogen.
- 300 hours of continuous operation without performance loss.

That kind of durability and efficiency puts this technology in the same league as industrial systems—without the same infrastructure or freshwater needs.

Built for the Real World

What's even cooler? This isn't just a lab demo. The team is already moving toward pilot-scale testing and envisioning modular hydrogen generators powered by solar energy. Picture solar-hydrogen farms along coastlines, turning seawater and sunlight into clean fuel for transport, electricity, and industry.

According to Professor Yousef Haik, co-author and mechanical engineering expert, the system's real power lies in how it handles the harsh environment of seawater. It cleverly manages chloride ions and creates a local acidic zone that boosts the crucial oxygen evolution reaction (OER)—a key part of hydrogen production.

A Big Step for Clean Energy

"This technology turns seawater from a challenge into a solution," Dr. Ul Haq explained. "It offers a scalable, sustainable path to clean hydrogen without draining precious freshwater resources."

With growing interest from clean tech startups and energy hubs, the research team hopes to see their invention used in large-scale hydrogen production—especially in coastal, arid regions where conventional methods fall short.

In short, this innovation proves that with the right materials and design, we can turn oceans into clean energy goldmines—efficiently, sustainably, and affordably.

– **CHARLI J, III-YEAR/MECHANICAL**

MIT's SODIUM FUEL CELL POWERS PLANES, CAPTURES CARBON, AND OUTRUNS BATTERIES

In a major step toward sustainable transportation, researchers at MIT have developed a new sodium–air fuel cell that could revolutionize how we power planes, ships, and trains. This innovation not only outperforms current lithium-ion batteries in energy density but also promises safety, low cost, and even carbon capture — all using abundant and affordable materials.

Unlike traditional lithium batteries, this fuel cell uses liquid sodium and ambient air to generate electricity, with no harmful emissions. In fact, it captures carbon dioxide from the atmosphere and turns it into baking soda — making it not just carbon-neutral, but potentially carbon-negative. As the pressure to decarbonize transport grows, this tech could be a game-changer.

Why It Matters: The Power Problem in Electric Transport

Today's batteries are hitting their limits. They're heavy, expensive, and don't store enough energy for large-scale applications like airplanes or freight trains. Electric vehicles work fine on roads, but the skies and seas demand more power per kilogram than lithium-ion batteries can deliver.

The MIT team's sodium–air fuel cell changes the game. It delivers three times the energy density of lithium batteries — enough to make regional electric flights a real possibility. And because it's a fuel cell, not a battery, it can be quickly refueled rather than recharged — another huge advantage in industries where downtime costs money.

How It Works: A Smart, Simple Design

The cell operates by combining liquid sodium with air, separated by a ceramic membrane that lets sodium ions pass through. The resulting reaction generates electricity, and unlike traditional fuels, the only byproducts are harmless — or even helpful.

What's especially interesting is how this system deals with emissions. Instead of releasing CO_2, it captures it. When sodium reacts with oxygen, it forms a compound that absorbs CO_2 from the air, eventually turning into baking soda. That means every flight or journey using this fuel cell could actually help remove carbon from the atmosphere.

Built for Safety and Scalability

Safety is a key advantage. Sodium is highly reactive, but in this setup, it's handled in a way that avoids the risks of fires or explosions common in high-energy batteries. And since the fuel is stored separately from the air (one reactant is always dilute), it's inherently safer than packed lithium batteries.

Even better, the fuel — sodium — is cheap, widely available, and easy to handle. It can be extracted from common salt, and the technology already exists to produce it at scale. The team is even exploring cartridge-based refueling systems: once a cartridge runs low, it can be swapped out and refilled like a propane tank.

From Drones to Planes: What’s Next?

Right now, the team is building small-scale versions, starting with drone-sized cells to prove the technology works in real-world conditions. If successful, this could scale up to fuel electric aircraft, marine vessels, or freight systems.

And with a new startup — Propel Aero — already in motion, we might not have to wait long to see it in action. The researchers aim to deliver a demonstration device within a year.

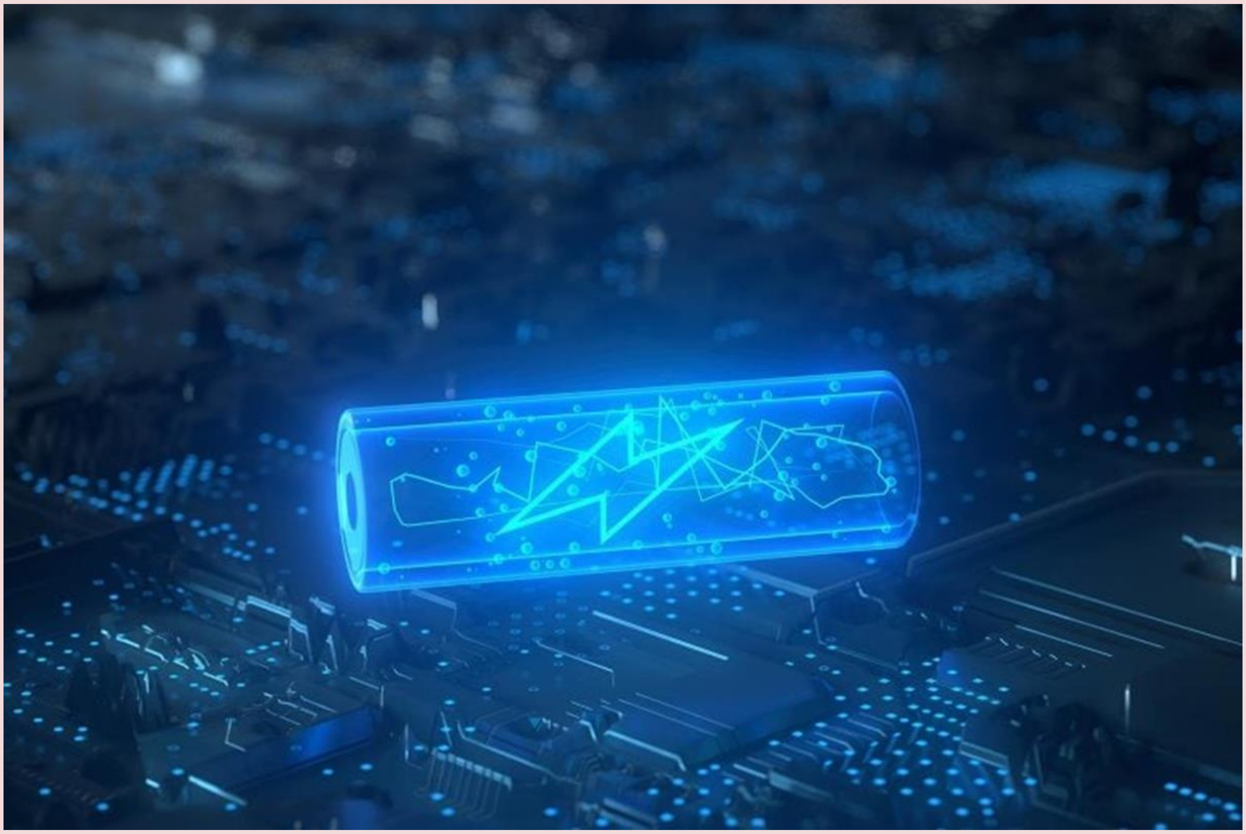
Final Thoughts: A Realistic Step Toward Electric Flight

This sodium–air fuel cell doesn’t just promise high performance — it solves real-world problems. It’s safer, cheaper, and cleaner, with the added bonus of capturing carbon dioxide. By merging concepts from fuel cells, battery science, and electrochemistry, the MIT team has crafted a power solution fit for the challenges of our time.

As Professor Yet-Ming Chiang, one of the lead researchers, puts it: “If people don’t think something is totally crazy at first, it probably isn’t going to be that revolutionary.” Crazy or not — this innovation might just help the future of flight take off, cleanly.

– **KALAISELVAN N, III-YEAR/MECHANICAL**

WORLD RECORD BROKEN: NEW MATERIAL REVOLUTIONIZES ION CONDUCTIVITY



A Record-Breaking Leap in Battery Tech: TUM's Solid-State Revolution

Imagine a battery that charges faster, lasts longer, and doesn't catch fire — that's the promise of solid-state batteries, and researchers at the Technical University of Munich (TUM) are getting us one giant step closer to making it a reality. In a breakthrough study, scientists have developed a brand-new material that sets a world record for lithium-ion conductivity — and it could reshape the future of energy storage.

Solid-State Batteries: The Safer, Smarter Future

Unlike the traditional lithium-ion batteries that power most of our devices today, solid-state batteries replace flammable liquid electrolytes with solid materials. This makes them safer and more energy-dense — but creating solid materials that let lithium ions move efficiently has been a huge challenge. Until now.

Led by Professor Thomas F. Fässler, the TUM research team has engineered a material made from lithium, antimony, and a small amount of scandium. This unique combo allows lithium ions to flow more than 30% faster than in any known solid electrolyte — making it the most conductive material of its kind ever recorded.

What's the Secret Sauce? Tiny Tweaks, Huge Results

The trick lies in atomic structure. The team figured out that by swapping a few lithium atoms for scandium, they could reshape the material's crystal lattice. This subtle change created "vacancies" — tiny empty spaces that act like express lanes for lithium ions. With these built-in pathways, the ions can move more quickly and smoothly, leading to record-breaking performance.

Double-Checking the Data

The numbers were so impressive, the researchers wanted to be absolutely sure. So, they teamed up with Prof. Hubert Gasteiger's lab at TUM's Chair of Technical Electrochemistry to validate the findings. Co-author Tobias Kutsch, who handled the testing, noted that because the material conducts both ions and electrons, the measurements were particularly tricky and required special adjustments.

Why It Matters: A New Blueprint for Battery Materials

According to Prof. Fässler, this discovery goes beyond just one material — it could represent an entirely new design principle for future battery technology. "By incorporating small amounts of scandium, we've revealed a strategy that can be applied to other element combinations," he explains. "It's not just a breakthrough — it's a blueprint."

The material doesn't just offer high conductivity. It's also thermally stable and can be produced using standard chemical processes, making it practical for future applications. The team has already filed a patent and is exploring how it could be used in real battery cells.

Opening the Door to a New Class of Materials

Lead author Jingwen Jiang from TUMint. Energy Research adds another exciting twist: “In addition to breaking conductivity records, we’ve uncovered a whole new class of materials.” While the previous record-holder needed five elements to work, this new lithium-antimony-scandium material achieves superior results with just three — making it simpler and potentially more scalable.

Better still, the concept can be applied to other systems like lithium-phosphorus, hinting at broader applications across battery research.

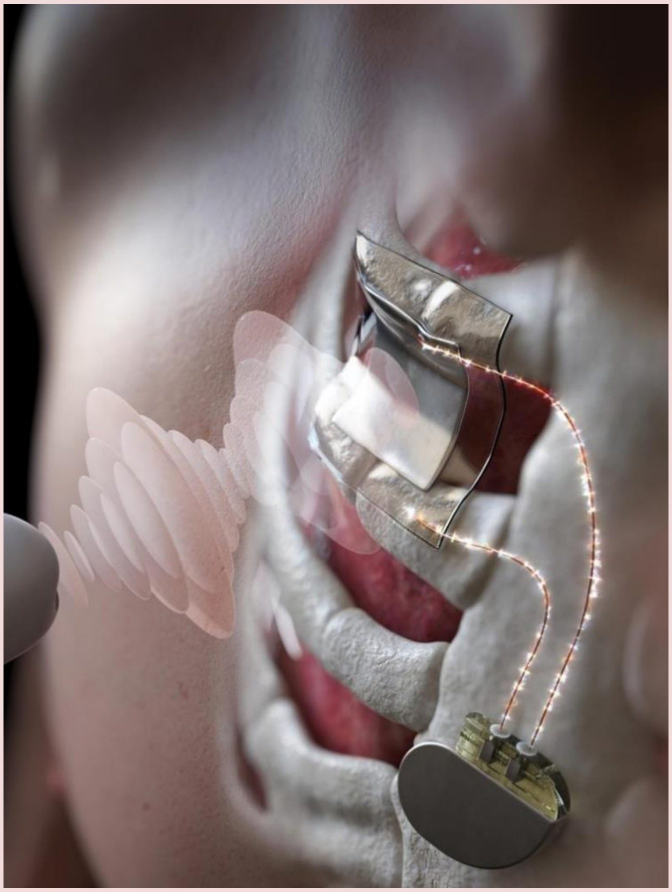
Final Thoughts: One Step Closer to Game-Changing Energy Storage

While it may take more time and testing before this new material ends up in the batteries of electric cars or smartphones, the implications are huge. With faster ion movement, greater safety, and easier manufacturing, this material could form the heart of the next generation of energy storage.

The race to build safer, faster-charging, and longer-lasting batteries just hit a new milestone — and the road ahead looks more electrifying than ever.

– **KAMESH R, III-YEAR/MECHANICAL**

THIS ULTRASONIC TECH CAN CHARGE DEVICES THROUGH WATER



Bending the Future: A New Way to Wirelessly Power Medical Implants Using Ultrasound

What if your pacemaker could charge wirelessly, just like your phone — but even more efficiently and safely? Thanks to a breakthrough by scientists at the Korea Institute of Science and Technology (KIST) and Korea University, that idea is becoming a reality. Their newly developed ultrasonic receiver could redefine how we power medical and underwater devices — and it works even when bent and flexed inside the human body.

The Problem with Traditional Wireless Charging

As more devices are designed to go inside our bodies — from pacemakers to neural implants — keeping them powered has become a major engineering challenge. Standard wireless charging methods, like those used in smartphones or earbuds, rely on electromagnetic induction or radio waves. But in medical and underwater environments, these methods just don't cut it.

Why? They have short transmission ranges, low efficiency in human tissue, and are prone to interference. That's where ultrasound steps in.

Why Ultrasound? It's Body-Friendly and Efficient

Ultrasound is already used in medical imaging (think: sonograms), so we know it's safe for the body. But it turns out ultrasound waves also travel better through biological tissues than electromagnetic waves — meaning they're more efficient for wireless power delivery.

Recognizing this potential, the research team led by Dr. Sunghoon Hur (KIST) and Professor Hyun-Cheol Song (Korea University) developed a special ultrasonic receiver that's both biocompatible and flexible — perfect for tight spaces inside the body or curved surfaces on the skin.

A Soft, Flexible Power Receiver That Still Packs a Punch

What makes this new receiver so special is its design. It uses piezoelectric materials — special substances that generate electricity when vibrated by sound waves. The researchers engineered a stretchable structure that sticks well to body tissues and still performs reliably even when bent or deformed.

Their prototype transmitted 20 milliwatts of power underwater at a distance of 3 cm — and 7 milliwatts through human tissue at the same depth. That's enough energy to keep many wearable or implantable devices running continuously.

In fact, they even used it to light up an LED bearing the KIST logo, purely through wireless ultrasonic charging — a bright symbol of what's to come.

What This Means for Medicine and Beyond

This tech isn't just for pacemakers and biosensors. It could also power underwater drones and marine sensors — devices that are notoriously hard to keep charged for long durations. Because the system works reliably underwater and within biological tissues, it opens new doors for safe, long-term, and efficient power delivery in hard-to-reach environments.

Dr. Hur summed it up: "We've shown that wireless power transmission using ultrasound isn't just theory — it's practical." The next steps? Miniaturizing the technology and pushing toward commercialization.

Final Thought: A Wave of Innovation Ahead

This flexible ultrasonic receiver could one day power everything from smart patches to deep-sea robots. With its body-friendly design and stable performance, it's not just another advancement — it's a paradigm shift in how we think about powering the tech that lives inside us and around us.

– **GOVINDHARAJ N, III-YEAR/MECHANICAL**

SCIENTISTS DEVELOP NEW SOLAR DEVICE THAT SQUEEZES WATER FROM AIR

Imagine pulling clean water straight from the air — using nothing but a sponge-like material and the power of sunlight. That's exactly what a team of engineers from RMIT University in Australia and Chinese research institutions have achieved. Their new sponge-based device may be small, but it could have a massive impact in solving one of the world's biggest challenges: water scarcity.

Water from Thin Air

Led by Dr. Derek Hao, the team has designed a compact, solar-powered device that absorbs moisture from the air and then releases clean water into a cup — all with minimal energy and cost. Unlike fog catchers or other high-tech systems, this one works even in low-humidity environments, making it incredibly practical in dry, remote, or disaster-stricken areas.

Here's the magic: a natural balsa wood structure — modified with smart materials like lithium chloride, carbon nanotubes, and iron oxide nanoparticles — soaks up water from the air when exposed. Close the lid and leave it in the sun, and it releases that water into a collection cup. It's like nature's sponge with a tech upgrade!

A Powerful Little Sponge

In lab tests, nine sponge cubes weighing only 0.8 grams each were able to absorb and release 15 milliliters of water. At 90% humidity, just 1 gram of material absorbed around 2 milliliters of water and released it within 10 hours of sunlight — a performance that beats many existing methods.

Even under low humidity (30%), the sponge absorbed 0.6 milliliters per gram, proving it's effective in a wide range of climates. And in outdoor trials, the device collected 2.5 milliliters per gram overnight, achieving a daily efficiency of 94%.

Affordable, Flexible, and Tough

What makes this invention truly exciting is how cheap, natural, and scalable it is. Balsa wood is abundant and biodegradable. The sponge stays flexible and functional even after 20 days at –20°C, and its performance only dropped by 12% after 10 cycles, showing impressive durability.

Dr. Hao says the team's design is meant to be modular and easily scaled up. Though the current prototype is just 15 cubic millimeters, it can be expanded into larger units or arrays to meet different water needs.

A Game-Changer for Remote and Emergency Use

Because the system needs only sunlight — no power grid, no complex infrastructure — it's perfect for off-grid communities, disaster relief, or arid regions where clean water is scarce. Dr. Hao's team is already in talks with industry partners to scale up the device and explore real-world deployment.

Smart Tech Meets Smart Design

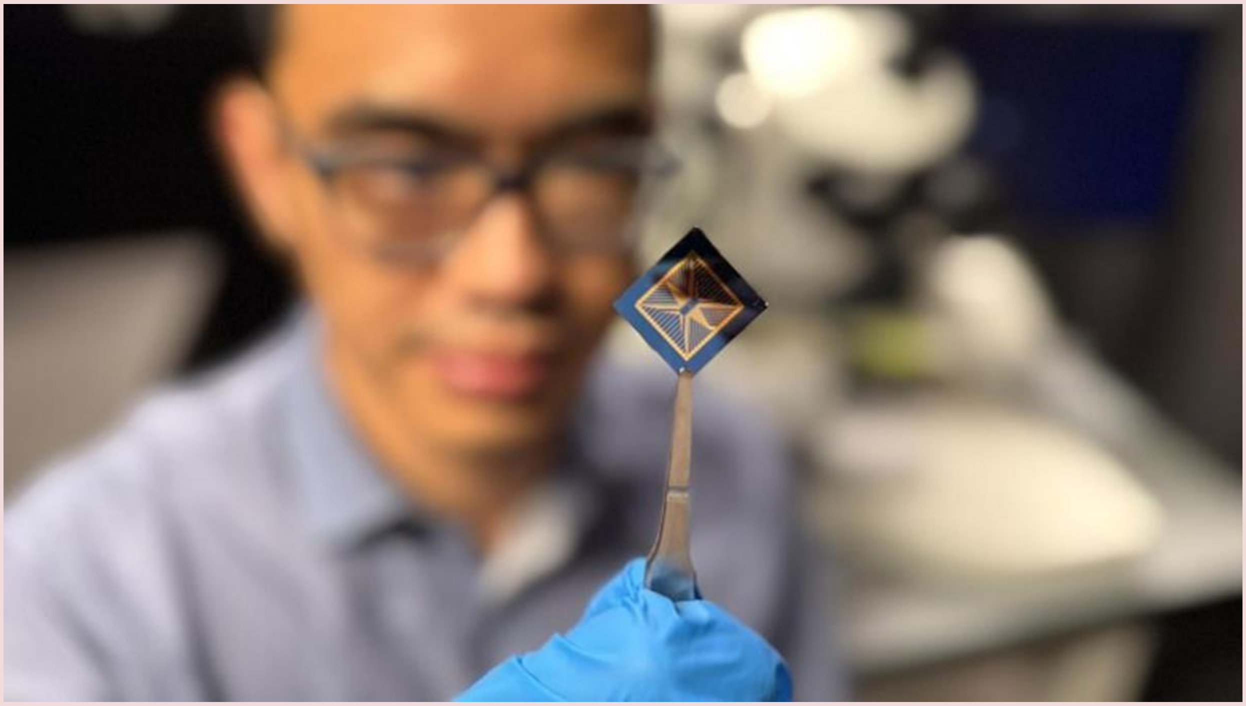
The device's performance is fine-tuned using artificial intelligence, which helps predict how it will behave under different weather conditions. Looking ahead, the team is working on automated control systems, IoT sensors, and potentially integrating thermal energy storage so it can work even at night.

Dr. Hao summed up the innovation perfectly:

"This material is designed to be scalable, affordable, and efficient — all while using only sunlight to produce clean water. That makes it a powerful tool for the future."

– **NOOR MOHAMMED D, III-YEAR/MECHANICAL**

THIS TINY CHIP SEES LIKE AN EYE, THINKS LIKE A BRAIN, AND REMEMBERS INSTANTLY



A Brain-Inspired Device That Sees, thinks—and Learns

By a Student Contributor | RMIT University

Imagine a device that doesn't just see but thinks—just like the human brain. In a ground-breaking project, engineers at RMIT University have developed a neuromorphic vision device that can detect motion, process what it sees, and even form visual memories—all without needing a bulky external computer.

This mini marvel could one day power faster robots, safer self-driving cars, and smarter tech that interacts more naturally with people.

- "Neuromorphic" means brain-like—and that's exactly what this invention is: a device that mimics how our brain processes and remembers what we see.

How It Works: Thinking in Analog

Traditional tech relies on digital processing, which is fast but consumes a lot of power. In contrast, the neuromorphic system created by the RMIT team uses analog-style signal processing, much like how neurons work in the brain. This not only boosts energy efficiency but also allows the device to react instantly to changes in its environment.

According to Professor Sumeet Walia, Director of the RMIT Centre for Opto-electronic Materials and Sensors (COMAS), this type of system could dramatically reduce the energy needed for visual processing in technologies like autonomous vehicles.

The Magic Material: Molybdenum Disulfide (MoS_2)

At the heart of this new tech is MoS_2, a material just a few atoms thick. When light hits the material, tiny atomic-level defects generate electrical signals—similar to how neurons "fire" in the brain.

This capability makes MoS_2 ideal for devices that can both sense visual stimuli and store them as memories. In other words, the device doesn't just see a waving hand—it remembers the motion and learns from it.

Smarter, Safer Tech for Real-World Use

This kind of real-time vision system could be a game-changer in high-risk settings. For example, autonomous vehicles might detect changes in traffic conditions instantly, without needing to process huge amounts of video data frame-by-frame.

- “Neuromorphic vision could be the key to life-saving decisions made in real time,” said Prof. Walia.

In robotics, too, this technology could make machines more responsive and human-like—helping them work more effectively as personal assistants or in collaborative manufacturing.

From Single Pixel to Smarter Systems

PhD scholar Thiha Aung, the first author on the study, demonstrated how a single-pixel version of the device can perform real-time motion detection and memory storage. Now, the team is working to scale up the technology to an array of pixels for more complex visual tasks.

- "Our material successfully mimics a leaky integrate-and-fire neuron—a key part of spiking neural networks," said Aung.

What's Next: Hybrid Systems and Global Impact

While this brain-inspired device is still at the proof-of-concept stage, its potential is massive. The team plans to create hybrid systems that combine this analog neuromorphic vision with traditional digital computing—getting the best of both worlds.

Their future work includes exploring other materials to push capabilities into the infrared range, which could enable real-time sensing of air pollution, toxic gases, or even pathogens.

RMIT has already filed a provisional patent, and the research was recently publihed in Advanced Materials Technologies.

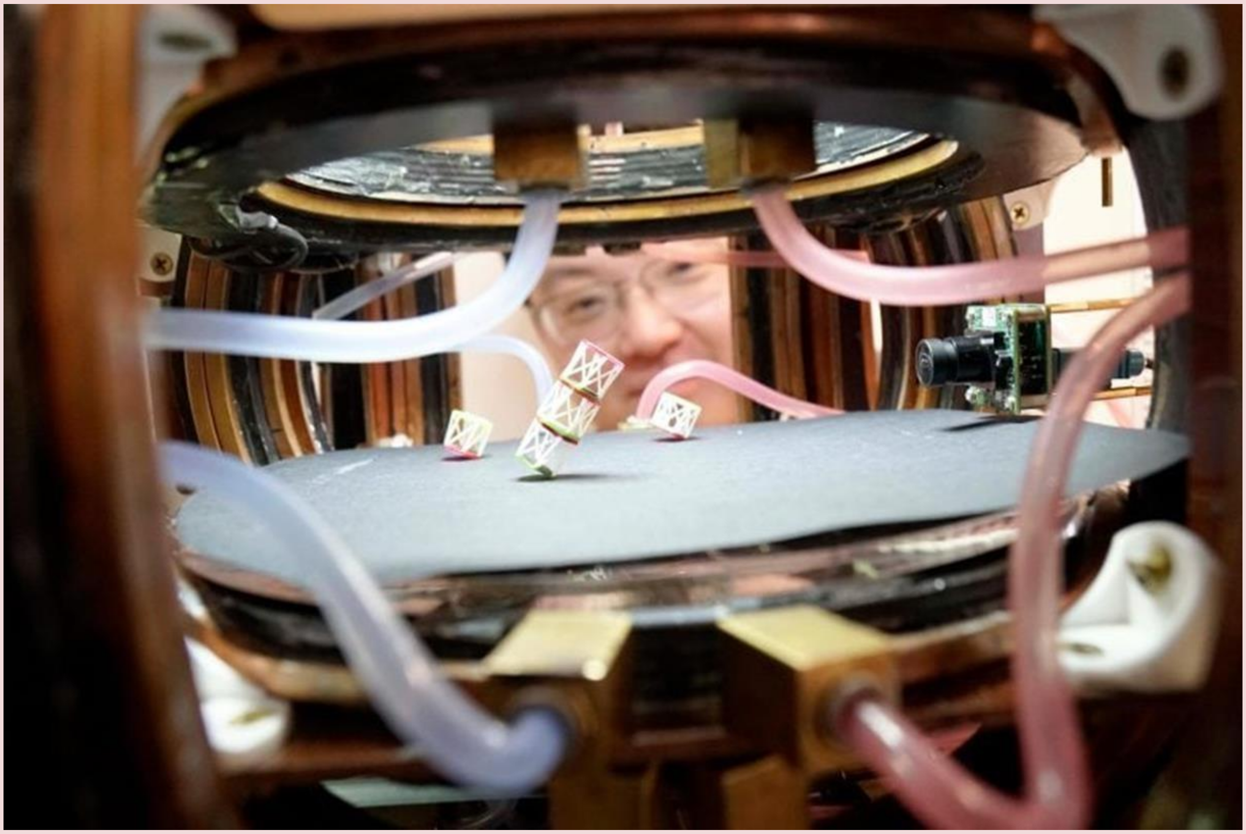
Conclusion: A Step Closer to Brain-Like Machines

As we move into an age of smarter machines, neuromorphic devices like this could redefine how technology sees and understands the world around it—using less energy, reacting faster, and working more naturally with humans.

- "It's not about replacing traditional computing," Prof. Walia said. "It's about complementing it—bringing us closer to truly intelligent machines."

– **GOWTHAM C, IV-YEAR/MECHANICAL**

PRINCETON ENGINEERS DEVELOP "METABOT" THAT IS BOTH A MATERIAL AND A ROBOT



The Shape-Shifting Material That Acts Like a Robot—No Motors Required

By a Student Contributor | Princeton University

Imagine a material that can move, change shape, and respond to commands—all without a motor, gears, or electronics inside. Sounds like something out of Transformers, right? But this is no science fiction.

In an exciting breakthrough, engineers at Princeton University have developed a shape-shifting metamaterial that behaves like a robot but is entirely driven by magnetic fields. Built using soft plastics and smart magnetic components, this "metabot" can expand, bend, twist, and move—all by remote control.

- "You can transform between a material and a robot," said Professor Glaucio Paulino, who led the research. "It's controllable with an external magnetic field."

Origami Meets Robotics: The Birth of the Metabot

The researchers were inspired by origami, the art of paper folding, to design a modular, reconfigurable structure. The result is a metamaterial—a material whose properties come from its structure, not its chemical makeup.

By applying electromagnetic signals, the team could manipulate the shape and behavior of this material in real time. These magnetic commands carry both power and control signals, enabling the metabot to twist, contract, and even "walk" without any internal motors.

- “Each behavior is simple, but together they produce very complex movement,” said Professor Minjie Chen, a co-author of the study.

Inside the Metabot: How It Works

At the core of the design is a geometric folding structure known as the Kresling pattern, used in origami. The researchers created hollow plastic tubes that twist when compressed and compress when twisted. By connecting two mirror-image Kresling tubes into a single cylinder, they created a structure that can respond in different ways depending on the direction of the magnetic field.

This mirroring property—called chirality—enables asymmetric behavior, a trait rare in most materials. For example, twisting the metabot in one sequence causes it to collapse, but reversing the twist order causes an even deeper collapse. This behavior mimics hysteresis, a complex phenomenon where a system’s response depends on its past states.

Beyond Movement: Medicine, Robotics, and Smart Materials

The potential uses for this technology are vast. The researchers envision microscopic metamaterials that can deliver drugs inside the body, assist in minimally invasive surgery, or help build next-gen soft robots that don’t need batteries or electronics.

They also built a thermoregulator using this material. It switches between heat-absorbing and reflective surfaces, which could be used in space or energy-efficient buildings. In one experiment, they changed the material's surface temperature from 27°C to 70°C and back again just by adjusting light exposure and magnetic signals.

- “This could shift how we approach soft robotics, energy absorption, and even aerospace applications,” said Professor Davide Bigoni, a solid mechanics expert in Italy.

From Micro Machines to Logic Systems

Using advanced laser lithography at the Princeton Materials Institute, the team created a prototype metabot just 100 microns tall—roughly the thickness of a human hair. These tiny systems might one day operate like physical logic gates, potentially offering an entirely new way to simulate complex processes that today rely on silicon chips.

- “This gives us a way to simulate non-commutative systems physically—something that’s hard to do mathematically,” said Paulino.

A New Era of Intelligent Matter

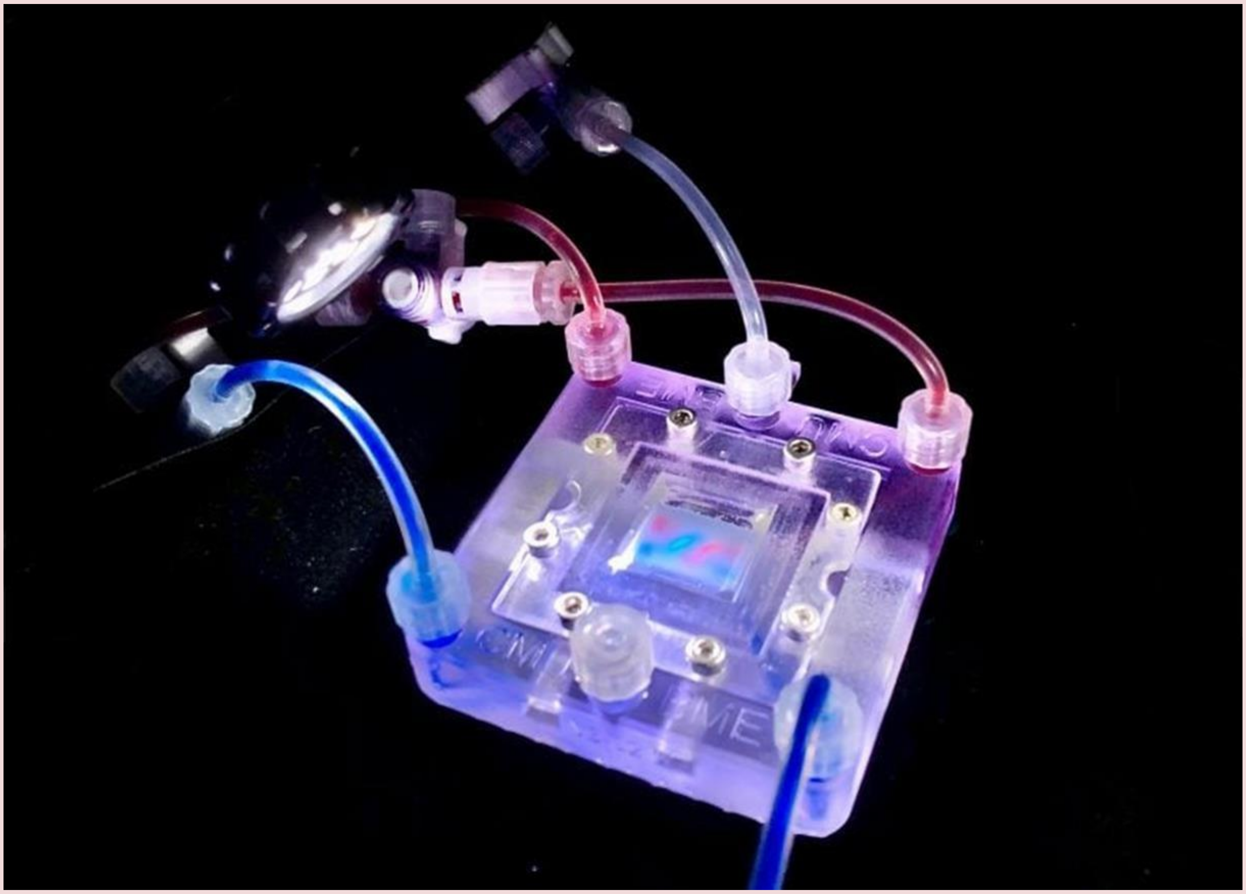
Experts are already calling this a milestone in materials science. Professor Xuanhe Zhao of MIT, who was not involved in the study, said the research opens “a new and exciting avenue in origami design and applications.”

Whether it's used in smart robots, adaptive medical tools, or programmable surfaces, this Princeton innovation points toward a future where materials themselves become machines.

- “It’s part robot, part material—and 100% groundbreaking,” said one researcher. “We’re not just designing machines anymore. We’re designing matter that can become machines.”

– **HARI PRASATH S, IV-YEAR/MECHANICAL**

PRINTING THE FUTURE OF LIFE: HOW 3D COLLAGEN SCAFFOLDS GROW REAL TISSUES



3D-Bioprinted Tissues: Engineering Life with Collagen and Innovation

By a Student Contributor | University of Pittsburgh

What if we could build living, functioning human tissues in the lab—using only collagen, cells, and a 3D printer? Scientists at the University of Pittsburgh are making that a reality.

In a cutting-edge study featured on the cover of Science Advances (April issue), Daniel Shiwarski, assistant professor of bioengineering, introduced a bioprinting method that uses collagen-based scaffolds to support real tissue growth. Unlike older models made from stiff plastics or elastomers, this new platform allows cells to grow, organize, and behave like they do inside the human body.

CHIPS and VAPOR: The New Language of Bioengineering

Shiwarski's invention, called CHIPS (Collagen-based High-resolution Internally Perfusable Scaffolds), is a type of 3D-bioprinted tissue matrix. These soft, sponge-like structures are designed to mimic the human body's natural cellular environment. By embedding cells directly into these collagen frameworks, researchers can watch tissues form, function, and even respond to external stimuli.

To support these living tissues, the team developed a complementary bioreactor system called VAPOR, which snaps together with the CHIPS like LEGO blocks. This system delivers nutrients through vascular-like pathways, mimicking the role of blood vessels and enabling complex tissue behavior.

From Printed Tissues to Insulin-Secreting Pancreas Models

In one striking demonstration, the team printed pancreatic tissue capable of detecting glucose and releasing insulin—a breakthrough that could transform type 1 diabetes treatment. By creating a fully biological system from natural materials, the researchers moved beyond traditional microfluidic models, which often use silicone and lack the flexibility to support truly lifelike behavior.

- "Microfluidic devices are useful, but synthetic materials limit their potential," said Shiwarski. "With collagen, we're not just printing a structure—we're enabling cells to grow within an environment they recognize."

Why Collagen Matters

Unlike plastic, collagen is a natural protein that's already found throughout the body. It provides the perfect base for cells to attach, communicate, and grow. In these new collagen-based systems, cells aren't just sitting passively—they're building functional tissues, just as they would inside a human organ.

The team even printed 3D vascular structures inspired by DNA helices, proving that these collagen networks can be shaped into sophisticated geometries. This ability to go beyond flat or layered designs opens the door to more realistic tissue models, capable of supporting intricate biological processes.

A Platform for Studying Disease—Without Animal Models

One of the most exciting aspects of this work is its potential to replace animal testing in biomedical research. The CHIPS platform provides a human-like environment for studying diseases such as hypertension, fibrosis, and diabetes—without needing to rely on simplified 2D cell cultures or animal models that often fall short.

- "Our goal is to model human diseases more accurately," said Shiwarski. "We can now explore how vascular networks form alongside tissue, and how diseases interfere with these processes—using human cells in human-like environments."

Open Science for a Collaborative Future

In the spirit of accelerating innovation, all CHIPS and VAPOR designs are open-source and freely available online. Shiwarski's team hopes this accessibility will enable more researchers to join in refining and expanding the technology.

By combining 3D printing, biomaterials, and the self-organizing intelligence of living cells, this project marks a huge leap forward in regenerative medicine and biomedical research.

- "Cells already know what to do," Shiwarski said. "We're just giving them the right space to do it."

– **MADHANKUMAR S, IV-YEAR/MECHANICAL**