

# Bulletin Board

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## Regulatory Update

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### ASIA PACIFIC

#### China adopts hazardous chemicals safety law

2026-01-05

**BEIJING** -- Chinese lawmakers on Saturday voted to adopt a law on the safety management of hazardous chemicals.

The law, which was passed at a session of the National People's Congress Standing Committee, will take effect on May 1, 2026.

Comprising 10 chapters, the law provides comprehensive regulation across the entire lifecycle of hazardous chemicals, covering their production, storage, use, business operations, transportation and emergency response.

The new law aims to strengthen the safety management of hazardous chemicals, prevent and reduce related accidents, safeguard public health and property, and protect the ecological environment.

Read More

Ministry of Justice of the People's Republic of China, 05-01-26

[http://en.moj.gov.cn/2026-01/05/c\\_1152839.htm](http://en.moj.gov.cn/2026-01/05/c_1152839.htm)

#### Have your say on proposed changes to health and safety in the workplace

2026-02-18

Home Parliamentary Business Select committees Committee press releases Have your say on proposed changes to health and safety in the workplace

Originally published: 18 February 2026

The Education and Workforce Committee is inviting submissions on the Health and Safety at Work Amendment Bill.

The bill seeks to improve the way New Zealand's workplace health and safety system operates by reducing unnecessary compliance costs; increasing clarity for businesses and organisations; and supporting reductions in the incidence of workplace fatalities, injuries, and illnesses. It proposes to do this by:

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amending the Health and Safety at Work Act 2015 and the WorkSafe New Zealand Act 2013 to update the purpose of each Act to focus on critical risks, prioritise work health and safety regulators' existing functions, and clarify duties relating to critical risks and overlaps with other legislation

enabling a process in the Health and Safety at Work Act for people and organisations to submit draft codes of practice to the appropriate regulator for recommendation to the Minister

amending the Health and Safety at Work (General Risk and Workplace Management) Regulations 2016 to align with proposed amendment to the Health and Safety at Work Act that would limit the duties of a "small PCBU" (person conducting a business or undertaking).

The Education and Workforce Committee is calling for submissions from the public and all interested parties, including businesses and other PCBUs under the Health and Safety at Work Act.

Read More

New Zealand Parliament, 18-02-26

<https://www3.parliament.nz/en/pb/sc/committees-press-releases/have-your-say-on-proposed-changes-to-health-and-safety-in-the-workplace/>

#### Guidance for health and safety representatives: asbestos

2026-01-22

Downloads

Download PDF - 181.9 KB

Download DOCX - 109.87 KB

This guide provides an overview of asbestos in the workplace to assist health and safety representatives (HSRs) exercise their powers and functions to represent workers in their work group. It is for HSRs in workplaces where the workers they represent may be at risk of exposure to asbestos, focused on the built environment. It does not cover the requirements for those involved in licensed asbestos removal or the management of naturally occurring asbestos.

As an HSR you can play an important role in representing members of your work group and bringing attention to issues such as the risk of exposure to

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asbestos. You are not expected to 'fix' the issue or be an expert on asbestos to exercise your HSR powers and functions.

Understanding more about asbestos can help you identify when things are not being managed well and when you might want to speak up.

Read More

Safe Work Australia, 22-01-26

<https://www.safeworkaustralia.gov.au/doc/guidance-health-and-safety-representatives-asbestos>

## AMERICA

### EPA Releases Draft Pesticide Registration Notice 2026-NEW: Notifications, Non-Notifications, And Minor Formulation Amendments

2026-02-17

On January 5, 2026, EPA released its draft Pesticide Registration (PR) Notice, entitled "Pesticide Registration Notice 2026-NEW: Notifications, Non-Notifications, and Minor Formulation Amendments" (Draft PRN 2026-NEW), and announced a 45-day public comment period. 91 Fed. Reg. 271. Since the January 5, 2026, announcement, an extension to the comment period has been published. 91 Fed. Reg. 6217. In the Draft PRN 2026-NEW, EPA provides proposed guidance to pesticide registrants submitting minor modifications to registrations having no potential to cause unreasonable adverse effects on the environment and that do not require extensive EPA review. See our January 8, 2026, blog item regarding the initial announcement of PRN 2026-NEW. More information is available in our January 30, 2026, memorandum. Comments are due on or before March 23, 2026.

Read More

Bergeson & Campbell, P.C., 17-02-26

<https://www.lawbc.com/recent-federal-developments-for-february-2026/>

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### Extension of Postponement of Effectiveness for Certain Provisions of Trichloroethylene (TCE); Regulation Under the Toxic Substances Control Act (TSCA)

2026-02-18

#### SUMMARY:

The Environmental Protection Agency (EPA or Agency) is extending the postponement of the effectiveness of certain regulatory provisions of the final rule entitled "Trichloroethylene (TCE); Regulation Under the Toxic Substances Control Act (TSCA)" for an additional 90 days. Specifically, this postponement applies to the conditions imposed on the uses with TSCA section 6(g) exemptions.

#### DATES:

As of February 17, 2026, EPA further postpones until May 18, 2026, the conditions imposed on each of the TSCA section 6(g) exemptions, as described in this document, in the final rule published on December 17, 2024, at 89 FR 102568.

#### ADDRESSES:

The docket for this action, identified by docket identification (ID) number EPA-HQ-OPPT-2020-0642, is available online at <https://www.regulations.gov>. Additional information about dockets generally, along with instructions for visiting the docket in-person, is available at <https://www.epa.gov/>.

Read More

US EPA, 18-02-26

<https://www.federalregister.gov/documents/2026/02/18/2026-03155/extension-of-postponement-of-effectiveness-for-certain-provisions-of-trichloroethylene-tce>

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### TSCA Section 21 Petition Seeks Risk Management Rule For Chemicals “Widely Used” In Consumer Liquid Laundry Detergents

2026-02-17

According to the EPA website, EPA received a petition on January 6, 2026, under Section 21 of the Toxic Substances Control Act (TSCA) regarding certain chemicals in consumer laundry detergents. The petition requests that EPA initiate a TSCA Section 6(a) rulemaking regarding the following chemical substances that are “widely used in consumer liquid laundry detergents”:

Sodium C10-16 alkylbenzenesulfonate;

Sodium laureth sulfate (SLES); and

1,4-Dioxane (present as a manufacturing impurity).

According to the petition, the chemical substances “present an unreasonable risk under their specific ‘conditions of use’ (i.e., residue remaining on clothing).” The petition notes that EPA’s 2020 risk evaluation for 1,4-dioxane identified unreasonable risks to health and that 1,4-dioxane is a byproduct of the ethoxylation process used to create SLES in detergents. The petition states that “[c]urrent regulations allow its hidden presence, exposing the public to chronic carcinogenic risks via dermal contact.” The petition also cites recent consumer reports indicating that “High Efficiency” washing machines “often fail to rinse these chemicals from fabrics, creating a continuous dermal exposure pathway that is not addressed by current labeling.” The petition requests that EPA issue a rule under TSCA Section 6(a) determining that the ongoing use of these chemical substances in consumer laundry detergents presents an unreasonable risk of injury to human health. The petition also seeks mandatory warning labels stating that “Concentrated residues of this product are known skin irritants” and mandatory disclosure on the product label when 1,4-dioxane is detectable above 0.1 parts per million (ppm) “due to its classification as a probable human carcinogen.” Under TSCA Section 21, EPA has 90 days from the date of receipt to grant or deny the petition.

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Bergeson & Campbell, P.C., 17-02-26

<https://www.lawbc.com/recent-federal-developments-for-february-2026/>

### Proposed Code of Practice for methanone, diphenyl- (Benzophenone) in paint, stain and/or coating products available to consumers in Canada

2026-02-13

#### 1. Objective of the Code of Practice

The objective of this code of practice (herein referred to as the “Code”) is to help reduce exposure of people in Canada to methanone, diphenyl- (benzophenone) contained in certain exterior and interior paint, stain and/or coating products available to consumers to levels that are protective of human health. The Code will help meet this objective by facilitating a reduction in both dermal and inhalation exposures to the general public from benzophenone during application of paint, stain and coating products. All applicable municipal, provincial, territorial and federal legal requirements pertaining to this substance and the associated products must still be met and a commitment by any person to adopt the practices and procedures set out in the Code does not remove obligations to comply with all applicable statutory and regulatory requirements.

This Code outlines the following recommended practice:

The concentration of benzophenone present in a paint, stain and/or coating product available to a consumer in Canada should not be more than 2,000 mg/kg (also expressed as 0.2% w/w)

#### 2. Background

Benzophenone was assessed in the third phase of the Government of Canada’s Chemicals Management Plan (CMP). The final screening assessment concluded that benzophenone is entering the environment in a quantity or concentration or under conditions that constitute or may constitute a danger in Canada to human life or health and therefore meets the criteria set out in section 64(c) of the Canadian Environmental Protection Act, 1999 (CEPA). The exposure sources of concern identified in the screening assessment are from the use of nail polishes, exterior and interior paints, as well as stains.

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Read More

Government of Canada, 13-02-26

<https://www.canada.ca/en/environment-climate-change/services/canadian-environmental-protection-act-registry/publications/code-practice-benzophenone.html>

### EPA Announces EPA Will Get “Back On Track” To Eliminate Animal Testing By 2035

2026-02-17

EPA Administrator Lee Zeldin announced on January 22, 2026, that the Agency was getting “back on track with reducing mammalian animal testing and recommitting to the ambitious goal laid out during the first Trump Administration to eliminate the practice by 2035.” According to EPA, the Office of Chemical Safety and Pollution Prevention (OCSPP) is committed to using a three-pronged strategy to ensure the Agency stays on track with phasing out animal testing and meeting the 2035 goal:

Identify New Approach Methods (NAM) that can currently be used as an alternative to traditional animal testing;

Conduct a comprehensive review of agency guidance and the Code of Federal Regulations to provide flexibility in fulfilling data requirements for toxicity assessments and issuing waivers to further reduce animal testing requirements; and

Encourage external researchers and data providers to use NAMs and apply for animal testing waivers whenever possible.

EPA Proposes To Update Voluntary Consensus Standards In Formaldehyde Emission Standards For Composite Wood Products

EPA proposed on February 11, 2026, to update the incorporation by reference of several voluntary consensus standards in the Agency’s formaldehyde standards for composite wood products regulations under TSCA due to the standards having been updated or superseded by the issuing organizations. 91 Fed. Reg. 6161. According to EPA, the new standards primarily update test methods and product standards concerning composite wood products that use formaldehyde. EPA also proposes to conform the updated standards in the scope and definitional sections in the final rule and to incorporate by reference a new small scale

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quality control chamber test method, similar to current methods already incorporated by reference. Comments are due March 13, 2026.

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Bergeson & Campbell, P.C., 17-02-26

<https://www.lawbc.com/recent-federal-developments-for-february-2026/>

## EUROPE

### Safe handling of fluoropolymers: a lifecycle approach

2026-02-17

Fluoropolymers are indispensable materials in modern industry, underpinning critical applications in aerospace, electronics, healthcare, energy, and beyond. Their unique properties – chemical resistance, thermal stability, non-stick characteristics, and biological inertness – make them irreplaceable in many environments where performance and safety are paramount. By Isabelle Alenus, Fluoropolymers Product Group (FPG).

The members of the Fluoropolymers Product Group (FPG) have made a commitment to advance best practices for the processing, safe-handling and waste management of fluoropolymers. The commitment is outlined in FPG’s Manufacturing Programme via three pillars: responsible manufacturing, the transparent sharing of best available techniques for emissions control, and safe handling.

Emission Reduction: A voluntary, industry-led initiative aims to minimise “non-polymeric PFAS residues from polymerisation aid technology” using state-of-the-art technologies. Their EU/UK milestones were met by late 2024/early 2025 (0.009% to air and 0.001% to water) and even more ambitious targets for reductions have been set for 2030.

Read More

European Coatings, 17-02-26

<https://www.european-coatings.com/news/legislation/safe-handling-of-fluoropolymers-a-lifecycle-approach/>

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## REACH Update

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### Highlights from February Member State Committee meeting

2025-12-19

ECHA/NR/26/08

Helsinki, 13 February 2026 - In its February meeting, ECHA's Member State Committee established an ad hoc working group on substances of very high concern (SVHC) equivalent level of concern cases and adopted its mandate.

The committee adopted its opinion on ECHA's draft proposal to add eight new substances to the draft Community Rolling Action Plan for 2026-2028. The plan covers substances to be evaluated by the Member States and ECHA will publish it in March. The evaluations aim to clarify whether these substances pose a risk to human health or the environment.

The MSC also agreed on four substance evaluations, two compliance checks and one testing proposal examination.

Further information

Meeting minutes [PDF][EN]

Member State Committee

Read More

ECHA, 19-12-25

<https://echa.europa.eu/-/highlights-from-february-member-state-committee-meeting-1>

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## Janet's Corner

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### Who Am I?

2026-02-27

I am the *intoxicating spirit* that has shaped human civilization for millennia, yet I'm also a humble solvent in laboratories and factories worldwide.

My molecular formula is  $C_2H_5OH$ , and I'm produced on an industrial scale through both fermentation of sugars and the *hydration of ethylene* from petrochemicals.

I serve as a fuel additive to gasoline, a disinfectant in hospitals, and a key ingredient in countless medicines and personal care products.

I am the active ingredient in beer, wine, and spirits, but my industrial importance far outweighs my role in beverages—I'm essential to biofuels and chemical synthesis.

**I am the intoxicating spirit that has shaped human civilization for millennia, yet I'm also a humble solvent in laboratories and factories worldwide.**

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## Hazard Alert

FEB. 27, 2026

### Hexachlorobutadiene

2014-03-18

Hexachlorobutadiene, also known as HCB, perchlorobutadiene, or Dolen-Pur, is a colourless liquid with the molecular formula C<sub>4</sub>Cl<sub>6</sub>. It has a turpentine-like odour and does not evaporate or burn easily. It is not known how it tastes or at what level people can taste it. Hexachlorobutadiene does not occur naturally in the environment. It is formed during the processing of other chemicals such as tetrachloroethylene, trichloroethylene, and carbon tetrachloride. [1,2]

### USES

Hexachlorobutadiene is used mainly as an intermediate in the manufacture of rubber compounds. It is also used in the production of lubricants, as a fluid for gyroscopes, as a heat transfer liquid, and in hydraulic fluids.[3] Outside of the United States it is used to kill soil pests. [1]

### EXPOSURE SOURCES & ROUTES OF EXPOSURE

#### Exposure Sources

Exposure hexachlorobutadiene can occur by breathing contaminated air, eating contaminated food, drinking contaminated water, or by direct skin contact with this chemical. People working in the industrial facilities where hexachlorobutadiene is formed or used may be exposed. Concentrations found in outside air were 2-3 parts hexachlorobutadiene per trillion parts of air (ppt). Levels were much higher in or near industrial facilities where hexachlorobutadiene is formed or used. Although hexachlorobutadiene is not very soluble in water, small amounts may be found in some public drinking water (less than 1 part hexachlorobutadiene per billion parts water [ppb]). It may also be found in underground water near hazardous waste sites. Hexachlorobutadiene has no agricultural or food chemical uses in the United States. Levels ranging from 0.1 to 4.7 milligrams per kilogram have been found in fish and shellfish because the compound is present in some surface water. Exposure at waste sites is most likely to occur from the landfill disposal of waste by-products originating from chlorinated hydrocarbon manufacture.

#### Routes of Exposure

Probable routes of human exposure to hexachlorobutadiene are:

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## Hazard Alert

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Inhalation;

Ingestion; and

Dermal contact

### HEALTH EFFECTS

#### Acute Health Effects

No information is available regarding the acute (short-term) effects of hexachlorobutadiene in humans from inhalation or oral exposure.

Animal studies have reported effects on the kidney and respiratory system from acute inhalation exposure, while oral animal studies have reported kidney effects.

Tests involving acute oral and inhalation exposures of rats and mice have shown hexachlorobutadiene to have high acute toxicity.

#### Carcinogenicity

No information is available regarding the carcinogenic effects of hexachlorobutadiene in humans or animals from inhalation exposure.

One study reported kidney tumours in rats exposed to hexachlorobutadiene orally.

EPA has classified hexachlorobutadiene as a Group C, possible human carcinogen.

EPA has calculated an oral cancer slope factor of 0.078 (mg/kg/d)<sup>-1</sup>.

#### Other Effects

No information is available regarding the developmental or reproductive effects of hexachlorobutadiene in humans.

One study reported that the frequency of abnormal sperm morphology did not increase significantly over controls in mice exposed to hexachlorobutadiene via inhalation. A study in rats exposed via inhalation reported no embryotoxic effects, except for a reduction in foetal body weights.

Oral animal studies have reported reduced fertility, reduced foetal body weights, but no birth defects or other developmental effects from hexachlorobutadiene exposure.

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## Hazard Alert

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### SAFETY

#### First Aid Measures

**If inhaled:** If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

**In case of skin contact:** Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

**In case of eye contact:** Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

**If swallowed:** Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

#### Personal Protective Equipment

The following personal protective equipment is recommended when handling hexachlorobutadiene:

Eye/face protection:

Tightly fitting safety goggles;

Faceshield (8-inch minimum);

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection:

Handle with gloves.

Gloves must be inspected prior to use.

Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product.

Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices.

Wash and dry hands.

The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

Body Protection:

Complete suit protecting against chemicals;

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The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection:

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls.

If the respirator is the sole means of protection, use a full-face supplied air respirator.

Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU.)

### REGULATION

#### United States

ACGIH: The American Conference of Governmental Industrial Hygienists has set a Threshold Limit Value (TLV) for hexachlorobutadiene is 0.02 ppm, 0.21 mg/m<sup>3</sup> TWA (Skin); Appendix A3 (Confirmed Animal Carcinogen with Unknown Relevance to Humans)

NIOSH: The National Institute for Occupational Safety and Health has established a Recommended Exposure Limit (REL): 0.02 ppm TWA (Skin); Potential carcinogen

OSHA: The Occupational Safety and Health Administration recommends that exposure to hexachlorobutadiene not exceed 0.02 ppm for an 8-hour workday over a 40-hour workweek. This limit is not enforced by the federal government, but it is the law in at least 25 states.

EPA: The Environmental Protection Agency has recommended guidelines on how much hexachlorobutadiene can be present in drinking water for specific periods of time without causing adverse health effects in humans. EPA recommends that exposures in children should not exceed 0.3 milligrams per litre of water (mg/L) for 10-day periods, or 0.1 mg/L for more than 7 years. If adults are exposed for long periods (more than 7 years), EPA recommends that exposure levels should not exceed 0.4 mg/L.

### REFERENCES

<http://www.atsdr.cdc.gov/phs/phs.asp?id=863&tid=168>

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<http://en.wikipedia.org/wiki/Hexachlorobutadiene>

<http://www.epa.gov/ttn/atw/hlthef/hexa-but.html>

<http://scorecard.goodguide.com/chemical-profiles/html/hexachlorobutadiene.html>

<http://www.sigmaaldrich.com/MSDS/MSDS/DisplayMSDSPage.do?country=AU&language=en&productNumber=112194&brand=ALDRICH&PageToGoToURL=http%3A%2F%2Fwww.sigmaaldrich.com%2Fcatalog%2Fproduct%2Faldrich%2F112194%3Flang%3Den>

[https://www.osha.gov/dts/chemicalsampling/data/CH\\_244725.html](https://www.osha.gov/dts/chemicalsampling/data/CH_244725.html)

<http://www.safeworkaustralia.gov.au/sites/swa/about/Publications/Documents/772/Workplace-exposure-standards-for-airborne-contaminants.docx>

# Bulletin Board

## Gossip

FEB. 27, 2026

### Self-healing composite could allow machines to last for centuries

2026-02-23

Imagine trying to design machines that will last forever, regardless of use or destination. Instead of those machines requiring a steady stream of spare parts (essentially impossible for space probes or exoplanetary landers to haul or acquire), they'll be able to heal their super-durable "flesh" more than a thousand times. Sound too good to be true?

Not to researchers at North Carolina State University, because they've created a fiber-reinforced polymer (FRP) composite that could make such machines a reality. In their Proceedings of the National Academy of Sciences paper "Self-healing for the Long Haul: In situ Automation Delivers Century-scale Fracture Recovery in Structural Composites," PhD candidates Jack Turicek and Zach Phillips, along with Dr. Kalyana Nakshatrala (Professor of Civil and Environmental Engineering at the University of Houston) reveal how their material's self-healing technique works.

When cracks form inside composites that separate fiber layers from the matrix, the UNC material repairs that interlaminar delamination using an electrically melted material that seeps into the cracks and bonds the separated layers.

That's excellent news for every person and every industry depending on cars, aerospace vehicles, wind turbines, and a range of structures using fiber-reinforced polymer (FRP) composites, which are made of layers of glass, carbon, or other fibers in a polymer matrix. While all FRPs are extremely strong despite their relatively light weight, UNC's self-healing FRP composites are even stronger than typical FRP composites, and compared with the standard FRP composite lifespan of decades (a problem since the 1930s), are practically immortal.

Now, while "practically immortal" doesn't mean these new FRP composites will actually last an eternity, they could last centuries, thus vastly outliving generations of people who designed and used the machines built from these composites. Such longevity also delivers enormous ecological benefits from reduced harvesting, processing, and production of materials, and also major cost savings.

According to Jason Patrick, corresponding author and associate professor of civil, construction, and environmental engineering at NCU, the

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innovation will “significantly drive down costs and labor associated with replacing damaged composite components, and reduce the amount of energy consumed and waste produced by many industrial sectors – because they’ll have fewer broken parts to manually inspect, repair or throw away.” With his patent, Patrick and his company Structeryx Inc. are already licensing the technology.

So, what allows the Structeryx FRP composites to exceed standard composite performance? One aspect is a thermoplastic healing substance 3D-printed...

Read More

New Atlas, February 2026

[https://newatlas.com/materials/self-healing-fiber-reinforced-polymer/?utm\\_source=newsletter.newatlas.com&utm\\_medium=newsletter&utm\\_campaign=spanish-church-144-years-in-the-making&\\_bhlid=3868495bf75c2da0fc900627512ebc9b513cefe4](https://newatlas.com/materials/self-healing-fiber-reinforced-polymer/?utm_source=newsletter.newatlas.com&utm_medium=newsletter&utm_campaign=spanish-church-144-years-in-the-making&_bhlid=3868495bf75c2da0fc900627512ebc9b513cefe4)

### A Flash of Light Can Build and Erase Crystals Instantly

2026-02-24

Scientists at NYU have discovered a way to use light as a kind of remote control for building and reshaping crystals.

Researchers at NYU have developed a way to use light to precisely direct how microscopic particles assemble into crystals. The findings, published today (February 24) in the Cell Press journal Chem, describe a straightforward and reversible approach to crystal formation that could help create a new class of adaptable, light-responsive materials.

Crystals, from snowflakes and diamonds to the silicon chips inside electronic devices, consist of particles arranged in highly ordered, repeating structures. To better understand how these patterns emerge, scientists often study colloidal particles, which are tiny spheres suspended in liquid that can spontaneously organize into what are known as colloidal crystals. These particles are also essential components in advanced materials used in optical and photonic technologies such as sensors and lasers.

Even though crystals are common and widely used, controlling exactly when and where they form has been a persistent challenge.

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“The challenge in the field has been control: crystals usually form where and when they want, and once conditions are set, you have limited ability to adjust the process in real time,” said study author Stefano Sacanna, professor of chemistry at NYU.

Melting of colloidal crystals in a focused laser spot. Credit: Steven van Kesteren / Sacanna Lab, NYU

In the new Chem study, the team discovered that simply shining light on their system gives them direct control over crystal assembly.

The researchers introduced light-sensitive molecules called photoacids into a liquid containing colloidal particles. When exposed to light, these photoacids temporarily become more acidic. That shift changes how they interact with the surfaces of the particles, altering the particles’ electric charge. By modifying the charge, the scientists can determine whether the particles attract each other and stick together or repel each other and separate.

“Essentially, we used light as a remote control to program how matter organizes itself at the microscale,” said Sacanna.

Through a combination of laboratory experiments and computer simulations, the team demonstrated that adjusting the intensity, timing, and pattern of light allows them to control crystal behavior with remarkable precision. They can trigger crystals to appear or dissolve on demand, choose where crystallization occurs, reshape and “sculpt” crystal structures, and improve their uniformity and size to build larger and more intricate colloidal assemblies.

“Using our photoacid gave us a surprising level of control...”

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Sci Tech Daily, February 2026

<https://scitechdaily.com/a-flash-of-light-can-build-and-erase-crystals-instantly/>

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FEB. 27, 2026

**Beyond silicon: These shape-shifting molecules could be the future of AI hardware**

Feb. 28, 2

For more than 50 years, scientists have searched for alternatives to silicon as the foundation of electronic devices built from molecules. While the concept was appealing, practical progress proved far more difficult. Inside real devices, molecules do not behave like simple, isolated components. Instead, they interact intensely with one another as electrons move, ions shift, interfaces change, and even tiny differences in structure can trigger highly nonlinear responses. Although the potential of molecular electronics was clear, reliably predicting and controlling their behavior remained out of reach.

At the same time, neuromorphic computing, hardware inspired by the brain, has pursued a similar goal. The aim is to find a material that can store information, perform computation, and adapt within the same physical structure and do so in real time. However, today's leading neuromorphic systems, often based on oxide materials and filamentary switching, still function like carefully engineered machines that imitate learning rather than materials that naturally contain it.

A new study from the Indian Institute of Science (IISc) suggests these two long-standing efforts may finally be coming together.

In a collaboration bringing together chemistry, physics, and electrical engineering, a team led by Sreetosh Goswami, Assistant Professor at the Centre for Nano Science and Engineering (CeNSE), developed tiny molecular devices whose behavior can be tuned in multiple ways. Depending on how they are stimulated, the same device can act as a memory element, a logic gate, a selector, an analog processor, or an electronic synapse. "It is rare to see adaptability at this level in electronic materials," says Sreetosh Goswami. "Here, chemical design meets computation, not as an analogy, but as a working principle."

This flexibility comes from the specific chemistry used to construct and adjust the devices. The researchers synthesized 17 carefully designed ruthenium complexes and studied how small changes in molecular shape and the surrounding ionic environment influence electron behavior. By adjusting the ligands and ions arranged around the ruthenium molecules, they demonstrated that a single device can display many different

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dynamic responses. These include shifts between digital and analog operation across a wide range of conductance values.

The molecular synthesis was carried out by Pradip Ghosh, Ramanujan Fellow, and Santi Prasad Rath, former PhD student at CeNSE. Device fabrication was led by Pallavi Gaur, first author and PhD student at CeNSE. "What surprised me was how much versatility was hidden in the same system," says Gaur. "With the right..."

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Science Daily, Feb. 28, 2

<https://www.sciencedaily.com/releases/2026/01/260101160857.htm>

**Heat waves that push up atmospheric nanoparticle levels might explain higher death tolls**

2026-02-17

Natural and anthropogenic organic molecules can both spontaneously self-assemble into supramolecular atmospheric nanoparticles during heat waves, research from the US has shown. 1 The work, which explains high levels of new particle formation during hot weather, could inform climate change models and help explain the death tolls associated with extreme heat events.

Heat waves can result in the formation of more airborne nanoparticles and that might help explain why these events are often so deadly

Clouds can both reflect heat to outer space and trap it in the Earth's atmosphere making them one of the most important feedbacks in climate change models, and the single most uncertain. Cloud formation requires nucleation of gaseous water molecules with acids. Around half of these are thought to be seeded by new particles like oxidised pollutants such as sulfur dioxide or volatile organic compounds in the lower atmosphere. Heat waves should naïvely be expected to cause increased evaporation of volatile organic compounds, reducing new particle formation, but this has not been well studied.

In 2004, a study by led by Renyi Zhang at Texas A&M University suggested that organic acids – produced when sunlight oxidises either natural volatile organic organic compounds such as pinene from trees or aromatic hydrocarbons from car engines – could form unusually stable complexes with sulfates in polluted air, enhancing aerosol production.

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The researchers have subsequently developed techniques allowing mass spectrometry of atmospheric particles as small as 3nm – around 60 molecules in total.

In their new work, they unveil measurements recorded over the course of a month on the Texas A&M campus. Some of the strongest new particle formation occurred when the temperature was well above 30°C. Sulfuric acid was only present in small amounts, suggesting that organic acids could not only form complexes with sulfuric acid, but they could self-assemble into nanoparticles on their own. 'Organic acids can form a double hydrogen bond, which is very stable, and there's multiple branches for them to grow,' explains Zhang. 'We believe that, if that's happening here, it's also happening in other places.'

More volatile organic compounds from industry and nature are oxidised to organic acids during extreme heat events, which leads to the formation of more supramolecular nanoparticles. These nanoparticles could have an impact on people's health

The spontaneous assembly mechanism is not...

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Chemistry World, February 2026

[https://www.chemistryworld.com/news/heat-waves-that-push-up-atmospheric-nanoparticle-levels-might-explain-higher-death-tolls/4022933.article?utm\\_source=cw\\_daily\\_tue&utm\\_medium=email&utm\\_campaign=cw\\_newsletters](https://www.chemistryworld.com/news/heat-waves-that-push-up-atmospheric-nanoparticle-levels-might-explain-higher-death-tolls/4022933.article?utm_source=cw_daily_tue&utm_medium=email&utm_campaign=cw_newsletters)

### Environmental Pollutants: A Growing Concern for Reproductive Health

2026-02-23

For the past several decades, fertility rates have been in decline. In 1950, the global total fertility rate was around 4.8, meaning that the average woman could expect to have 4– 5 children during her lifetime. By 2021, this fertility rate had more than halved to 2.3—just narrowly above the 2.1 figure needed for population size to remain stable.

There are many potential reasons for this large shift in fertility rate over the past 70 years. Changes in lifestyle, economic conditions, improved access to contraception, and progress in women's rights and autonomy are all important social factors.

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But scientists have also noticed a rise in male and female infertility in recent years. The increasing prevalence and incidence of other reproductive disorders, such as endometriosis and reduced sperm count , are also a concern.

Again, multiple factors could be at play here. General awareness of reproductive health conditions is considerably higher now than it was many decades ago, and medical diagnostic technology has also improved. However, a growing body of evidence suggests that exposure to environmental toxins is also a key contributor to this rise in reproductive health issues.

Environmental pollutants have already been linked to a wide array of chronic and acute health conditions . Air pollution from automobile emissions, burning waste, and volcanic eruptions can disrupt the respiratory system, cardiovascular system, and has been linked to an increased risk of cancers . Long-term exposure to lead—a common environmental contaminant due to its long use as a component in old paints and pipes—can lead to chronic kidney disease and neurological issues .

Now, research is beginning to shed light on the associations between environmental exposure to common pollutants and negative impacts on reproductive health and fertility.

"Comprehensive reviews connect environmental exposures to early puberty, endometriosis, polycystic ovary syndrome (PCOS), early menopause, longer time-to-pregnancy (when actively trying to conceive), higher odds of being infertile (not able to conceive within 12 months), irregular cycles, lower quality of eggs and embryos, lower ovarian response to hormone stimulations during IVF treatments, and higher risk of miscarriage," Prof. Pauliina Damdimopoulou , a professor of reproductive biology at the Karolinska Institutet, told Technology Networks .

Per- and polyfluoroalkyl substances (PFAS) are a family of thousands of highly fluorinated chemicals. PFAS found widespread use in the mid-20 th century as a component in commercial grease- and waterproof coatings, and as an agent in industrial firefighting foams....

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Technology Networks, February 2026

<https://www.technologynetworks.com/tn/articles/environmental-pollutants-a-growing-concern-for-reproductive-health-409947>

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**Nano-cage removes up to 98% of PFAS in tap water tests**

2026-02-25

This article has been reviewed according to Science X's editorial process and policies. Editors have highlighted the following attributes while ensuring the content's credibility:

Contamination of ground, surface and drinking water by perfluoroalkyl and polyfluoroalkyl substances (PFAS) affects millions of people worldwide. A promising new method developed by Flinders University scientists paves the way to help remove the most difficult-to-capture variants of these persistent pollutants from water.

The research team, led by Flinders ARC Research Fellow Dr. Witold Bloch, has discovered adsorbents that effectively capture PFAS, including short-chain forms that are especially difficult to remove using existing technologies.

The study, published in the *Angewandte Chemie International Edition*, showcases the use of a nano-sized molecular cage that acts as a highly selective "PFAS trap."

"While some long-chain PFAS can be partially removed using existing water treatment technologies, the capture of short-chain PFAS—which are more mobile in water—remains a major unresolved challenge," says project leader Dr. Witold Bloch, from Flinders University's College of Science and Engineering.

"We discovered that a nano-sized cage captures short-chain PFAS by forcing them to aggregate favorably inside its cavity. This unusually strong binding mechanism is different from that of traditional adsorbent materials."

The team embedded these molecular cages into mesoporous silica—an adsorbent that normally shows no PFAS binding properties.

First author Caroline Andersson, a Ph.D. candidate in chemistry at Flinders University, says the presence of the embedded nanosized cage enables a broad range of PFAS to be removed from water, including short-chain variants that are notoriously difficult to isolate.

"The most exciting aspect of this project was that we first conducted in-depth studies of how PFAS bind within the cage on the molecular level,"

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she says. "That allowed us to understand the precise binding behavior and then use that knowledge to design an effective adsorbent for PFAS removal."

Laboratory testing showed the adsorbent material can remove up to 98% of PFAS at environmentally relevant concentrations in model tap water.

"The adsorbent also demonstrated reusability, remaining highly effective after at least five cycles of reuse. These results highlight its potential for integration into water filtration systems for polishing drinking water at the final stage of treatment," adds Dr. Bloch.

"This research represents an important step toward the development of advanced materials capable of tackling one of the world's most persistent environmental contaminants," he concludes.

PFAS molecules from...

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Phys Org, February 2026

<https://phys.org/news/2026-02-nano-cage-pfas.html>

**EU adds hefty anti-dumping duties to 1,4-butanediol**

2026-02-17

The European Commission has introduced massive antidumping duties on imports of 1,4-butanediol (BDO), an important intermediate molecule in chemical manufacturing. The provisional duties are 106–114% on all imports originating in China, 52% for all imports from Saudi Arabia and 136–143% on all imports originating in the US.

1,4-butanediol is a key intermediate and component of in various coatings, polymers and solvents

'This is a step change in the EU ramping up its defenses against dumping,' says Richard Carter, an independent consultant to the chemical industry and former BASF manager. 'My hope is that this is the start of a more aggressive stance.'

The commission's 70-page report sets out the evidence and decision to impose duties. BDO is used in various coatings, polymers and solvents. Four companies generate BDO in the EU directly, employing around 500 staff in Germany, the Netherlands and Italy. The volume of imports from

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the three named countries increased from around 49,000 tonnes in 2018 to around 89,000 tonnes in 2024, an increase of 82%. Ineos (one of the four EU producers) has filed a raft of antidumping cases with the European Commission, including for BDO.

The problem, says Carter, is the buildup of massive overcapacity in China, allowing Chinese producers set prices that others must follow. Chinese capacity is now nine times larger than the EU, he adds. 'This is part of an onslaught to dominate western chemical markets, in my view,' says Carter. 'Trade flows show that European producers have almost switched off their plants and are bringing in BDO from their own facilities in the US.'

Ineos has also filed complaints for polyvinyl chloride, monoethylene glycol, terephthalic acid, butyl acetate and polyolefins. In a past statement, it complained about the staffing levels and the response times in the commission's antidumping investigations.

Anti-dumping investigations typically run for 12 to 15 months. 'It will take 3-6 months for the provisional duties to be applied, then another 6-9 months for the final duties to be applied, if passed,' says Mohamed Chilmeran, petrochemical analyst at Wood Mackenzie.

Parties told the Commission that EU industry was simply not competitive enough due to its high costs, but this was rejected. The industry was profitable in 2021 and 2022. 'The root cause of the injury was increasing volumes of dumped imports from the countries...

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Chemistry World, February 2026

[https://www.chemistryworld.com/news/eu-adds-hefty-anti-dumping-duties-to-14-butanediol/4022975.article?utm\\_source=cw\\_daily\\_tue&utm\\_medium=email&utm\\_campaign=cw\\_newsletters](https://www.chemistryworld.com/news/eu-adds-hefty-anti-dumping-duties-to-14-butanediol/4022975.article?utm_source=cw_daily_tue&utm_medium=email&utm_campaign=cw_newsletters)

### New lab technique can reverse chemical process linked with Alzheimer's disease

2026-02-24

This article has been reviewed according to Science X's editorial process and policies. Editors have highlighted the following attributes while ensuring the content's credibility:

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An Oregon State University scientist and a team of undergraduate students have uncovered real-time insights into a chemical process linked with Alzheimer's disease, paving the way toward better drug designs. The researchers used a molecule measuring technique to observe in a laboratory setting how certain metals can promote the protein clumping that leads to the blocked neural pathways associated with Alzheimer's. Led by Marilyn Rampersad Mackiewicz, associate professor of chemistry in the OSU College of Science, the research team also watched molecules known as chelators disrupt or reverse the clumping. The findings are published in ACS Omega.

Alzheimer's disease is the most common form of dementia, a chronic condition of impaired cognitive function that affects large numbers of older adults and their loved ones. According to the Centers for Disease Control and Prevention, Alzheimer's is the sixth-leading cause of death for people age 65 and older.

In Alzheimer's patients, aggregations of amyloid-beta proteins interrupt brain cells' ability to communicate with each other. The brain needs certain metals to work properly, but problems arise when the metals are present in unbalanced quantities.

"Too many of some metal ions, like copper, can interact with amyloid-beta proteins in ways that lead to protein aggregation, but most experiments have only shown the end result, not the interactions and aggregation process itself," Mackiewicz said.

"We developed a method that lets us observe those interactions live, second by second, and directly measure how different molecules interrupt or reverse them. It shifts the question from 'does something work?' to 'how does it work, and when?'"

A chelator, whose name comes from the Greek word for claw, is a type of molecule able to bind with metal ions as if gripping them tightly.

One of the chelators in the study was shown, via a technique known as fluorescence anisotropy, to effectively snatch up metal ions, but in a non-selective way; i.e., it didn't differentiate between the types of metals that promote amyloid-beta aggregation and the types that don't.

However, the scientists observed the other chelator showing a strong ability to selectively grasp the copper ions believed to be a factor in Alzheimer's.

"That kind of real-time...

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Phys Org, February 2026

<https://phys.org/news/2026-02-lab-technique-reverse-chemical-linked.html>**The Universal Antivenom That Could Combat the World's Deadliest Snakebites**

2026-01-09

Snakebites are a neglected public health issue in many tropical and subtropical countries that, without treatment, can lead to amputations, permanent disabilities, and death. While antivenoms exist, they are produced using century-old methods that rely on harvesting antibodies from animals that have been injected with venom. These antivenoms often only protect against specific snake venoms and can produce adverse side effects in patients.

Research efforts are ongoing to develop safer, broad-spectrum antivenoms that can be manufactured at scale and at lower cost. During the PEGS Europe 2025 conference, Technology Networks sat down with Dr. Andreas Laustsen-Kiel, professor and head of section for biologics engineering at the Technical University of Denmark, to explore the challenges with the current standard of care for venomous snakebites. Laustsen-Kiel also discussed a new recombinant antivenom that he and his team developed, capable of protecting against Africa's deadliest snakes.

Unlike many other disease areas that have benefited from continued innovation, snakebite treatments haven't changed much in the last century. Traditional antivenoms utilize antibodies isolated from immunized animals such as horses, which Laustsen-Kiel states is "arguably closer to a blood transfusion from a horse than a drug." Utilizing animal antibodies in antivenoms made for humans can produce serious side effects, and these antivenoms are only effective for specific species of snake.

Each of the over 600 venomous snake species produces a unique mix of toxins, with no single antivenom able to combat them all. "It's a fragmented disease with a fragmented market, hindered by an assortment of different regulations that you need to go through if you want a therapy to reach different geographies," explained Laustsen-Kiel.

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"Producing traditional antivenoms is expensive, and it's not a process that scales very well. In addition, the process doesn't just produce the neutralizing antibodies of interest, but all the antibodies typically found in a horse. Typically, only 10-30% of the antibodies produced are relevant," Laustsen-Kiel added.

As a result of these challenges, many manufacturers have ceased production of antivenoms, and prices have increased dramatically, making treatment unaffordable for many of the people who need it most.

Most victims of snakebites live in rural areas of Africa, Asia and Latin America. These areas typically suffer from poor geographical access and inadequate health services, with a lack of available and accessible antivenoms acting as a leading cause of death from snakebites.

To build awareness of the challenges posed by snakebites, the World...

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Technology Networks, January 2026

<https://www.technologynetworks.com/tn/articles/the-universal-antivenom-that-could-combat-the-worlds-deadliest-snakebites-408403>**With the flip of a switch, scientists harness light to program how particles interact and assemble**

2026-02-24

This article has been reviewed according to Science X's editorial process and policies. Editors have highlighted the following attributes while ensuring the content's credibility:

NYU scientists are using light to precisely control how tiny particles organize themselves into crystals. Their research, published in Chem, provides a simple and reversible method for forming crystals that can be used to develop a new generation of adaptable materials.

Crystals—from snowflakes and diamonds to the silicon used in electronics—are made up of particles arranged in repeating patterns. To study how crystals form, some scientists use colloidal particles—microscopic spheres suspended in liquid that self-assemble into colloidal crystals. Colloidal particles are also the building blocks for advanced materials, including those used in optical and photonic technologies like sensors and lasers.

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Despite the ubiquity and utility of crystals, it remains difficult to manipulate them.

“The challenge in the field has been control: crystals usually form where and when they want, and once conditions are set, you have limited ability to adjust the process in real time,” said study author Stefano Sacanna, professor of chemistry at NYU.

In their new study, the researchers found a simple and powerful way to control particles and form crystals: illuminating them.

The team added light-sensitive molecules, or photoacids, to a solution of liquid and colloidal particles. When light is shined on the photoacids, they temporarily become more acidic, which influences how they interact with the surfaces of colloidal particles. As a result, this changes the electric charge on the particles, which directly controls whether the particles attract or repel each other.

“Essentially, we used light as a remote control to program how matter organizes itself at the microscale,” said Sacanna.

In a series of experiments and simulations, the researchers showed that by adjusting light intensity, timing, and spatial patterns, they can trigger crystals to form or melt on demand, decide where crystallization happens, reshape and “sculpt” crystals, and improve their order and size to fabricate larger, more complex colloidal structures.

“Using our photoacid gave us a surprising level of control over the attraction between particles. Just turning the light up or down a little made the difference between the particle fully sticking or being fully free,” said study author Steven van Kesteren of ETH Zürich, who conducted this work at NYU as a postdoctoral researcher in Sacanna’s lab.

“Because...”

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Phys Org, February 2026

<https://phys.org/news/2026-02-flip-scientists-harness-particles-interact.html>

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## Curiosities

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### Gold “supraballs” capture about 90% of the solar spectrum

2026-02-24

At any given moment, 89,000 terawatts of solar power hits the Earth’s surface. While significant advancements have been made in harvesting this power, existing technologies do not capture the full potential of the entire solar spectrum. This limitation primarily lies in these technologies’ incomplete absorption of the sun’s ultraviolet, visible, and infrared radiation.

A team of researchers at KU-KIST Graduate School of Converging Science and Technology, Seoul, has now reported a way of absorbing nearly the full usable solar spectrum in thermal-based devices, using self-assembling gold nanospheres called plasmonic colloidal supraballs.

Solar radiation spans ultraviolet (3-5%), visible (40-45%), and infrared (50-55%) wavelengths. Photovoltaic (PV) cells primarily convert visible light and part of the near-infrared spectrum into electricity, leaving much of the remaining energy untapped. Concentrated solar systems collect broader wavelengths using mirrors, but require large-scale infrastructure and still depend on receiver materials that are not perfectly absorbing. Solar-thermal collectors absorb visible and infrared light relatively well, yet their efficiency is constrained by surface coatings that rarely achieve near-total absorption.

This is where the plasmonic supraballs come in.

The new technology starts as a colloidal suspension of gold nanoparticles, which self-assemble into micrometer-scale spheres in solution. Thousands of nanoparticles cluster together to form “supraballs” and the liquid is then drop-cast onto the ceramic surface of a thermoelectric generator, forming a dense, textured film that efficiently captures sunlight.

Conventional gold nanoparticle films and dielectric absorber coatings do already exist that can increase light absorption in specific wavelength ranges and reduce heat re-radiation. However, they often suffer from limited infrared absorption, angular sensitivity, high manufacturing costs, and thermal degradation over long-term thermal exposure.

Plasmonic supraballs work differently. Localized surface plasmon resonances (LSPR) at the nanoparticle surfaces, combined with Mie-type resonances within the spheres, trap photons across UV, visible, and

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near-infrared wavelengths, converting much of this energy into heat. This results in ~90% absorption across the solar spectrum, significantly improving thermal energy capture and creating a stronger temperature gradient that ultimately generates nearly 2.4 times the power output of conventional nanoparticle coatings.

The team, comprising Jaewon Lee, Seungwoo Lee, and Kyung Hun Rho, published their research in the journal ACS Applied Materials & Interfaces .

It is important to note that the plasmonic supraball technology is primarily designed for thermal-based solar systems, such as thermoelectric solar generators (TEG systems), solar-thermal collectors, and thermal management and passive heating systems. They could also play a role...

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New Atlas, February 2026

[https://newatlas.com/energy/plasmonic-supraballs-solar-spectrum/?utm\\_source=newsletter.newatlas.com&utm\\_medium=newsletter&utm\\_campaign=spanish-church-144-years-in-the-making&\\_bhlid=a6c47cb06ab78a851ab3493d909dd1fb4b54b986](https://newatlas.com/energy/plasmonic-supraballs-solar-spectrum/?utm_source=newsletter.newatlas.com&utm_medium=newsletter&utm_campaign=spanish-church-144-years-in-the-making&_bhlid=a6c47cb06ab78a851ab3493d909dd1fb4b54b986)

### Could Fermented Kombu Be the Next Superfood?

2026-02-24

Kombu ( *Saccharina japonica* ) is a brown seaweed extensively cultivated and consumed in Japan, Korea and China. Despite its nutritional value, its strong fishy and grassy odour can deter some consumers. Additionally, many of kombu's nutrients are locked inside rigid cell walls and dense networks that the human digestive system cannot easily break down. As a result, much of this treasure trove of nutrients passes through the body without being absorbed.

A team of food scientists at NUS has found a way to unlock the trapped nutrients in kombu and replace the unpleasant odours with more appealing scents, directly overcoming the two major challenges - limited nutrient bioaccessibility and poor sensory experience.

Enzymes and lactic acid bacteria (LAB) fermentation have been commonly used to improve kombu's nutritional value by breaking down large proteins and carbohydrates into smaller, more digestible components. However, these approaches cannot effectively remove the compounds that give kombu its characteristic fishy and grassy odour.

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Building on the knowledge that yeast fermentation can naturally produce pleasant fruity and floral aromas, the NUS scientists took the process a step further by co-fermenting enzyme-treated kombu with LAB and an aroma-producing yeast. The result is a novel probiotic kombu-based blend that is both healthier and more flavourful.

The team's work was published in the scientific journal International Journal of Food Microbiology .

In their earlier work published in October 2025 , the NUS team demonstrated that fermenting enzyme-treated kombu with LAB effectively releases trapped nutrients. In their latest work, enzyme-treated kombu was fermented using LAB together with an aroma-producing yeast. Analysis of the fermented kombu blend revealed that the LAB-yeast co-fermentation promotes the growth and survival of probiotics compared to LAB-only fermentation. One particular co-fermentation mixture (using the LAB, *L. plantarum* and the yeast, *P. kluyveri* ) yielded more  $\gamma$ -aminobutyric acid (GABA), a well-known bioactive compound commonly linked to calming effects, stress reduction, and potential benefits for mental health. Importantly, the co-fermentation greatly reduced unpleasant off-flavour compounds while introducing compounds associated with the aromas of bananas and pears.

"Kombu has a tremendous amount of untapped potential to be a superfood, but for its health benefits to reach a wider population, kombu has to be more palatable and its nutrients more accessible," said Associate Professor Liu Shao Quan from the Department of Food Science and Technology in NUS Faculty of Science . "While enzymatic treatment followed by lactic acid bacteria fermentation..."

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Technology Networks, February 2026

[https://www.technologynetworks.com/applied-sciences/news/could-fermented-kombu-be-the-next-superfood-409967?utm\\_campaign=NEWSLETTER\\_TN\\_Breaking%20Science%20News&utm\\_medium=email&\\_hsenc=p2ANqtz-8A1V6oQJ0DtKpvhq7adGNYWgkArBbkz5MqDH-34kNnrOsXdHtG-Qm4eNTAr3nNrSSWjCaLcsB4hiZLnIkK1kqbHK0d3A&\\_hsmi=405259109&utm\\_content=405259109&utm\\_source=hs\\_email](https://www.technologynetworks.com/applied-sciences/news/could-fermented-kombu-be-the-next-superfood-409967?utm_campaign=NEWSLETTER_TN_Breaking%20Science%20News&utm_medium=email&_hsenc=p2ANqtz-8A1V6oQJ0DtKpvhq7adGNYWgkArBbkz5MqDH-34kNnrOsXdHtG-Qm4eNTAr3nNrSSWjCaLcsB4hiZLnIkK1kqbHK0d3A&_hsmi=405259109&utm_content=405259109&utm_source=hs_email)

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### AI gets water right: How a hydration shield helps proteins keep their shape

2026-02-25

This article has been reviewed according to Science X's editorial process and policies. Editors have highlighted the following attributes while ensuring the content's credibility:

A study published in the Journal of the American Chemical Society reports that artificial intelligence can enhance protein stability in an unexpected way—by engineering the water around a protein, not just the protein itself. Researchers led by Dr. Kuen-Phon Wu, at Institute of Biological Chemistry, Academia Sinica and Institute of Biochemical Sciences, National Taiwan University, found that AI-designed ubiquitin-fold proteins can achieve exceptional resilience by creating a protective, “mesostructured” hydration shell on their surface.

Protein stability under harsh conditions is central to modern bioengineering, enabling more robust therapeutics and industrial enzymes. For decades, the dominant strategy has been to strengthen a protein's hydrophobic core. But when Wu's team used the deep-learning design tool ProteinMPNN to redesign ubiquitin (Ub) and related Ub-fold proteins (including ISG15), the resulting variants took a different route. The redesigned proteins—R4, R10, and ICV variants—showed striking resistance to conditions that typically destabilize natural proteins.

In stress tests, the AI-generated variants remained folded and functional under extreme heat (reportedly above 120 °C) and under strongly denaturing chemical conditions (a combination of pH 3 and 8 M urea). To uncover the mechanism behind this resilience, the team combined advanced NMR spectroscopy with molecular dynamics simulations.

Their analyses indicate that the AI strategically redistributed and clustered surface charges to organize surrounding water into a highly ordered network—a “mesostructured hydration shell.” This structured water layer acts like a hydration shield, helping buffer the protein from thermal and chemical stress and reducing pathways that initiate unfolding.

“Some people think ‘Water Breathing’ belongs to fantasy,” the team notes. “But what we're seeing is designable physical chemistry: by tuning a protein's surface, AI can make water form a more ordered hydration layer that measurably strengthens stability under extreme conditions.”

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The findings establish mesostructured hydration as a sequence-encoded, engineerable stability mechanism, opening a new direction for protein design. Beyond reinforcing the “dry” core, future biopharmaceuticals and biocatalysts may be made more durable by commanding the “wet” exterior—the water that surrounds and protects the folded structure.

Building on this discovery, the team envisions that what once seemed like an AI “myth” has now been physically decoded into a tangible design principle. By revealing how surface charge patterning programs structured hydration, the work...

Read More

Phys Org, February 2026

<https://phys.org/news/2026-02-ai-hydration-shield-proteins.html>

### This Blue-Light Iron Breakthrough Could Make Drug Production Cheaper

2026-02-25

A blue-light-powered iron catalyst just replaced rare metals — and unlocked a milestone in precision drug synthesis.

Photocatalysts are materials that trigger chemical reactions when exposed to light. In modern organic chemistry, metal-based photocatalysts are especially valuable because they are stable and can be fine-tuned by adjusting the ligands attached to the central metal atom. These ligands influence how the catalyst behaves and what kinds of molecules it can help build.

Common photocatalyst metals such as ruthenium and iridium work well but are rare and costly. To address this, researchers at Nagoya University in Japan previously introduced an iron-based alternative. However, that earlier system depended on large quantities of expensive chiral ligands, which act as structural guides that determine the three-dimensional shape of the final chemical product.

In a new study published in the Journal of the American Chemical Society, the team reports a redesigned iron catalyst that cuts chiral ligand use by two-thirds. The catalyst also operates under energy-efficient blue LED light, making the process more practical and potentially more sustainable.

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Using this improved system, the scientists completed the asymmetric total synthesis of (+)-heitziamide A. This natural compound, found in medicinal plants, is known to suppress respiratory bursts. The work was carried out by Professor Kazuaki Ishihara, Assistant Professor Shuhei Ohmura, and graduate student Hayato Akao at Nagoya University's Graduate School of Engineering.

In their 2023 work, the group developed an iron photocatalyst that incorporated three chiral ligands per iron atom. Yet only one of those ligands actually influenced enantioselectivity, meaning much of the material was not contributing to the desired three-dimensional control. That made the system less efficient than it could be.

The newly engineered catalyst takes a different approach. It pairs an inexpensive achiral bidentate ligand with a chiral ligand to form a specific iron(III) salt structure. The chiral ligand directs the three-dimensional arrangement of the product, while the achiral bidentate ligand adjusts and enhances the catalyst's overall activity.

With this design, the team achieved a highly controlled radical cation (4 + 2) cyclization. In this reaction, two molecular components join to create a six-membered ring. The method allows chemists to construct 1,2,3,5-substituted adducts, structural patterns frequently seen in natural products such as heitziamide A.

"The new catalyst design represents the definitive form of chiral iron(III) photoredox catalysts," stated Ohmura, one of the study's corresponding authors. "We believe this achievement marks a significant milestone in..."

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Sci Tech Daily, February 2026

<https://scitechdaily.com/this-blue-light-iron-breakthrough-could-make-drug-production-cheaper/>

### PFAS waxes found on skis and snowboards lead to three Olympic disqualifications

2026-02-18

South Korean Dasom Han was disqualified from the women's sprint event after her skis were found to have banned PFAS-containing waxes on them

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Three athletes have been disqualified from events at the Milan–Cortina Winter Olympics because of alleged use of ski waxes containing per- and polyfluoroalkyl substances (PFAS). A ban on these waxes was announced by the International Ski and Snowboard Federation (FIS) in 2019 that took effect in 2023 and involves testing for fluorinated ski waxes using Fourier Transform Infrared (FTIR) spectroscopy. These are the first Winter Olympics to feature such a prohibition.

PFAS – also known as 'forever chemicals' – are a family of an estimated 15,000 synthetic chemicals that have been widely used in consumer products globally since the 1950s. They all share a characteristic carbon chain with multiple fluorine atoms attached. They do not degrade easily in the environment because the carbon–fluorine bond is among the strongest in existence. The unique properties of these substances confer characteristics like repellence to oil, grease and water, as well as temperature resistance and friction reduction. This helps to create products that are non-stick and stain-resistant, for example.

However, PFAS are also highly mobile in the environment and they bioaccumulate, as well as biomagnify, up the food chain. PFOA and PFOS – the best studied of these substances – have been linked to serious health conditions like reproductive and developmental disorders, reduced immune function and certain types of cancer.

Last week, two female South Korean cross-country skiers and a Japanese male snowboarder were disqualified from Olympic events after their equipment tested positive for PFAS waxes. The three have only been excluded from the events where their equipment tested positive for PFAS and can still take part in other events. The Japanese snowboarder, Shiba Masaki, pushed back and pointed out that he had used the same board and wax in elite competitions leading up to these Olympics and never tested positive.

'I have undergone fluorine testing at every World Cup competition using the same board and wax configuration, and have never tested positive,' Masaki posted on Instagram. 'When it comes to waxing, we do our own work during practice, but during competition we officially requested a professional serviceman to finish the board.'

Meanwhile, South Korean media outlets reported that the Korean Sport and Olympic...

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Chemistry World, February 2026

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### 'Lock-and-key' chemistry keeps cancer drugs inactive until they reach tumor sites

2026-02-25

This article has been reviewed according to Science X's editorial process and policies. Editors have highlighted the following attributes while ensuring the content's credibility:

Many therapeutic molecules used in cancer treatments are highly toxic, often harming healthy tissues and causing significant side effects. This creates a critical need for strategies that localize their toxic activity to tumors. What if cancer drugs could stay dormant until they reach cancer cells? A new study by Syracuse University researchers demonstrates a promising chemistry-based strategy that could do just that.

Xiaoran Hu, assistant professor of chemistry in the College of Arts & Sciences (A&S), and his team introduced a prototyping "lock-and-key" system that holds therapeutic drugs in an inactive, caged form until a separate chemical trigger releases them at a specific site. The study was published in *Angewandte Chemie International Edition*. It introduces a new platform to control when and where chemical bonds break inside living systems.

"We are developing a broadly applicable tool that has the potential to regulate the activity of different types of therapeutics," Hu says. "Think of this as a tool, like a hammer, that could be used on different nails."

The cornerstone of this work is the concept of biorthogonal chemistry, which describes chemical reactions that proceed in a highly selective fashion such that these reactions can be conducted in biological systems (e.g., within cells or the body) without disturbing native biological processes—and, at the same time, the complex biological environment doesn't interfere with the reactions. This "biorthogonal" approach would

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allow researchers to control specific chemical actions inside cells and tissues with great precision.

In Hu's study, a drug molecule is caged in a safe, inactive form, so it cannot harm healthy tissues. Once this caged drug encounters a "trigger" molecule, they will rapidly and selectively react with each other and release the toxic drug within this triggering environment. If the "trigger" is introduced to a specific location, like a tumor, it will enable localized drug release.

"Our drug-activation chemistry can be conducted in complex biological environments and does not perturb native biomolecules and cellular processes," Hu says. "In the future, this process could improve treatment precision and reduce side effects from drugs acting in the wrong places."

More specifically, this platform uses biorthogonal supramolecular chemistry, which allows specific "host" molecules to recognize and connect with their...

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Phys Org, February 2026

<https://phys.org/news/2026-02-key-chemistry-cancer-drugs-inactive.html>

### Scientists unlocked a superconductor mystery under crushing pressure

Jan. 17, 2

Superconductors are materials that allow electrical current to flow with no resistance. This unique ability makes them extremely valuable for technologies such as efficient power transmission, energy storage, magnetic levitation systems, and quantum computers.

The challenge is that superconductivity usually occurs only at very low temperatures, far below everyday conditions. This limitation has prevented widespread practical use. That picture began to change with the discovery of superconductivity in hydrogen-rich materials. Hydrogen sulfide (H<sub>3</sub>S) becomes superconducting at 203 Kelvin (-70°Celsius), while lanthanum decahydride (LaH<sub>10</sub>) reaches superconductivity at 250 Kelvin (-23°Celsius). These temperatures are far higher than those of earlier superconductors and are above the boiling point of liquid nitrogen, which is why scientists classify them as high temperature superconductors. Their discovery

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marked a major step toward the long-standing goal of room-temperature superconductivity.

### The Superconducting Gap and Why It Is Crucial

At the heart of superconductivity is a feature known as the superconducting gap. This property reveals how electrons join together to form the superconducting state and serves as a clear signature that distinguishes a superconductor from an ordinary metal.

Understanding the superconducting gap is essential because it directly reflects how electrons interact inside the material. Without measuring this gap, scientists cannot fully explain why a material becomes superconducting or what mechanism makes resistance disappear.

### Why Measuring Hydrogen Superconductors Is So Difficult

Despite their importance, hydrogen-rich superconductors such as H<sub>3</sub>S have been extremely challenging to study. These materials can only be created under enormous pressures that exceed atmospheric pressure by more than a million times. Because of these extreme conditions, widely used techniques like scanning tunneling spectroscopy and angle-resolved photoemission spectroscopy cannot be applied.

As a result, the superconducting gap in these materials had remained unmeasured, leaving a major gap in scientists' understanding of how high-temperature superconductivity works in hydrogen-rich compounds.

### A New Tunneling Technique Breaks the Barrier

To solve this problem, researchers at the Max Planck Institute in Mainz developed a planar electron tunneling spectroscopy method that can operate under these extreme pressures. This new approach made it possible to directly probe the superconducting gap in H<sub>3</sub>S for the first time.

With this technique, the team obtained a clear picture of the superconducting state in hydrogen-rich materials, overcoming a barrier that had limited progress in the field for years.

The researchers found that H<sub>3</sub>S has a fully open superconducting gap of approximately 60...

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Science Daily, Jan. 17, 2

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### How to grow an enormous single crystal

2026-02-19

Top tips from David Boyce and his class, who have cultivated a 3kg single copper sulfate crystal

David Boyce and students at Queenswood School have grown a giant single crystal of copper sulfate over the course of a year

A classic school experiment involves growing copper sulfate crystals. Allowing water to slowly evaporate from a saturated copper sulfate solution is the main way to form regular crystals. Yet, if you want a particularly large single crystal, this method can take a while – for example, some natural crystals found in caves grow over thousands of years.

David Boyce and his students at Queenswood School in the UK have developed a different method, using it to grow a copper sulfate crystal that measures around 15cm in length. While this may not be the biggest – a title that goes to the 70kg copper sulfate crystal grown by a class in Germany – Boyce's is supposedly the largest single crystal.

But how big can you grow such crystals? Boyce shares his tips below.

Starting off the crystal is the main trick. Boyce explains that they suspended a smaller single crystal in a deep tray containing room temperature copper sulfate solution, before adding a second container of hot, saturated solution. He adds that the ratio of these solutions should be around two to nine.

'The temperature instantly drops down, so the crystal is not exposed to high temperature, but the solution is now supersaturated, so it instantly deposits all the copper sulfate onto the crystal.' Repeating this process regularly will slowly build up the crystal.

But also think about how safe it is to have large amounts of saturated solutions in the lab and where you'll grow the crystal. Boyce suggests a fumehood so 'no dust settles on the top [of the crystal], but there's an airflow, which enables the [solution] to evaporate.'

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Suspending the crystal allows it to grow without interference from the sides of the container

Copper sulfate contains around 1% sodium chloride, meaning that if the solution evaporates too much, the salt can crystallise out as copper chloride, explains Boyce. This can turn the crystal green. Continually monitoring the crystal and topping it up with fresh saturated solution every few days should overcome this issue.

'About once a month or so, I tip all the copper sulfate [solution] out into a bucket, and then I bash off all the...

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Chemistry World, February 2026

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### Iron and blue LEDs synthesize natural molecules, cutting the need for expensive chiral components

2026-02-25

This article has been reviewed according to Science X's editorial process and policies. Editors have highlighted the following attributes while ensuring the content's credibility:

Photocatalysts facilitate chemical reactions by absorbing light. Metal-based photocatalysts are widely used in organic synthesis due to their durability and the ability to tune their function by modifying the ligands attached to the central metal atom. Most metals used in photocatalysts, such as ruthenium and iridium, are rare and expensive. Researchers at Nagoya University, Japan, previously developed an iron-based alternative, but it required large amounts of costly chiral ligands, which act as spatial templates to determine the three-dimensional structure of chemical products.

In a recent study published in the Journal of the American Chemical Society, the researchers developed an iron catalyst that reduces the use of chiral ligands by two-thirds and enables photocatalytic reactions under energy-efficient blue LED light.

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Using this new catalyst, they completed the asymmetric total synthesis of (+)-heitziamide A, a natural compound from medicinal plants that suppresses respiratory bursts.

Professor Kazuaki Ishihara, Assistant Professor Shuhei Ohmura, and graduate student Hayato Akao at Nagoya University's Graduate School of Engineering developed this technology.

In their 2023 study, the researchers developed an iron photocatalyst that used three chiral ligands per iron atom, but only one-third of these ligands contributed to enantioselectivity, making the process inefficient.

Meanwhile, the newly developed iron photocatalyst combines cost-effective achiral bidentate ligands with chiral ligands to target a specific iron(III) salt structure. The chiral ligand controls the three-dimensional configuration, while the achiral bidentate ligand tunes the catalytic activity.

Using this catalyst, researchers achieved a precise radical cation (4 + 2) cyclization, joining two molecules to form a hexagonal ring. This method enables the synthesis of 1,2,3,5-substituted adducts, structures common in natural products such as heitziamide A.

"The new catalyst design represents the definitive form of chiral iron(III) photoredox catalysts," stated Ohmura, one of the study's corresponding authors. "We believe this achievement marks a significant milestone in advancing iron-based photocatalysis."

While artificial synthesis of heitziamide A has been previously reported, the total asymmetric synthesis of its natural enantiomer has not yet been achieved.

Using selective six-membered-ring formation with an iron photocatalyst activated by blue light, the researchers achieved the first total asymmetric synthesis of (+)-heitziamide A. This indicates that using the mirror-image catalyst would also allow the synthesis of (-)-heitziamide...

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Phys Org, February 2026

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### Tirzepatide Could Burn Fat, Not Just Reduce Hunger

2026-02-25

Tirzepatide is one of the drugs that has revolutionized the treatment of obesity and other conditions such as diabetes in recent years. Despite its clinical success, its precise molecular and cellular mechanisms are still not fully understood. A study in mice shows that the drug has a direct impact on improving metabolism by activating brown adipose tissue, a type of fat specialized in energy expenditure. According to the researchers, these results help to better understand the mechanisms of action of tirzepatide and open up new avenues for developing more comprehensive treatments for obesity and other metabolic diseases.

The study was led by Marion Peyrou, Ramón y Cajal researcher at the Faculty of Biology and the Institute of Biomedicine of the University of Barcelona (IBUB), the Sant Joan de Déu Research Institute (IRSJD) and the CIBER in Physiopathology of Obesity and Nutrition (CIBEROBN).

Tirzepatide (generic name of the drug Mounjaro) is a product approved for weight control in adults with obesity or overweight with comorbidities, and also for the treatment of poorly controlled type 2 diabetes mellitus. Unlike other anti-obesity drugs, it acts simultaneously on the receptors of two hormonal factors: GIP and GLP-1. This dual action leads to significant body weight loss, mainly through reduced food intake.

To better understand how tirzepatide works, researchers conducted a comprehensive analysis of the drug's effects on different adipose tissue deposits using an experimental mouse model, as this type of analysis is not feasible in humans. First, they treated obese mice — fed a high-fat diet — with tirzepatide. The results were compared with those of a group of mice that had not received the drug but had consumed the same amount of food. This comparison made it possible to separate the effects of the drug itself from those derived solely from reduced food intake.

The results of the analysis show that tirzepatide activates brown adipose tissue, i.e. it stimulates a type of fat that specializes in 'burning' calories from food, unlike white adipose tissue, which mainly stores fat and is the type that accumulates in obesity. "This activation is associated with an increased capacity to burn metabolic energy and with the production of batokines by brown adipose tissue, molecules that are beneficial for metabolism," says Marion Peyrou.

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This finding is significant because it indicates that tirzepatide has metabolic effects beyond the weight loss it causes as a result of reducing appetite and, therefore,...

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Technology Networks, February 2026

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