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*** While Chemwatch has taken all efforts to ensure the accuracy of information in this publication, it is not intended to be comprehensive or to render advice. Websites rendered are subject to change.**

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ASIA PACIFIC

Display of Calorie and Nutrition Information In Menus for More Informed Decisions by Consumers

2024-10-14

Question No. 6179

To ask the Minister for Health (a) whether additional steps will be taken to encourage food and beverage (F&B) establishments to display calorie and nutrition information alongside their menus; and (b) whether the Ministry is considering new regulations for F&B chains to provide such information to enable consumers to make more informed decisions in choosing healthier food.

Answer

1. We have not made it a requirement for food and beverage (F&B) establishments to display calorie information. Based on our population disease profile, the Ministry of Health (MOH) assessed it is more important to provide information on nutrients that will be harmful if over-consumed, namely, sugar, sodium and saturated fat.
2. We therefore have several initiatives in place to achieve this. For example, larger F&B establishments are required to display Nutri-Grade labels on their menus for Grade C or D beverages that are higher in sugar and saturated fat.
3. Under the Health Promotion Board (HPB) voluntary Healthier Dining Programme (HDP), participating F&B establishments may display identifiers on their store fronts and menuboards to inform consumers of the availability of healthier options, including those that are lower in sugar or calories. As of March 2024, more than 3,100 F&B establishments, with over 9,000 outlets island-wide, have joined the HDP.
4. We are also planning to introduce mandatory labelling of prepackaged products (e.g. sauces and seasonings) for sodium and saturated fat content, and will continue to encourage F&B establishments to choose healthier ingredients.
5. MOH and HPB will continue monitoring the impact of existing measures. We remain open to considering further measures, voluntary or mandatory, that are practicable and implementable in our local context, to support Singaporeans in adopting healthier diets.

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Read More

Singapore, Ministry of Health, 14-10-24

<https://www.moh.gov.sg/news-highlights/details/display-of-calorie-and-nutrition-information-in-menus-for-more-informed-decisions-by-consumers>

Banned Substances Detected Annually In Health Products and Plans for Enhanced Public Education for Consumers

2024-09-10

Question No. 6075

To ask the Minister for Health (a) how many cases of health products containing banned substances has the Health Sciences Authority (HSA) detected annually in the past three years; and (b) whether HSA plans to step up public education to inform consumers to purchase health products from reputable pharmacies, retailers' websites, and those with an established retail presence in Singapore.

Answer

6. Over the last 3 years, HSA has detected an average of 10 cases of health products containing banned and prohibited substances per year.
7. HSA regularly issues press releases on the adverse reactions that result from use of illegal health products. Consumer advisories on making discerning choices in the purchase of health products from reputable sources such as pharmacies or online shops with established retail presence in Singapore are provided through HSA's website, social media platforms and the local news media.

Read More

Singapore, Ministry of Health, 10-09-24

<https://www.moh.gov.sg/news-highlights/details/banned-substances-detected-annually-in-health-products-and-plans-for-enhanced-public-education-for-consumers>

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South Korea Updates List of Restricted and Prohibited Chemicals

2024-10-17

On September 26, 2024, the Ministry of Environment of South Korea issued Notice No. 2024-612, announcing significant amendments to the designations of restricted and prohibited substances. The revisions aim to update the usage limits of certain chemicals based on the hazard assessment results under the Chemicals Registration and Evaluation Act, as well as considering related international regulations.

The specific amendments include:

- Chrysotile and mixtures containing more than 1% chrysotile (previously coded 06-5-7) were removed from the restricted substances list and added to the prohibited substances list under code 06-4-27 (which previously included mixtures containing more than 1% crocidolite). The manufacture, import, sale, storage, transportation, and use of these substances are prohibited.
- The restriction for code 06-5-8 was expanded to include lead and its compounds, prohibiting their use in paints unless specifically for the manufacture and maintenance of certain aviation or military equipment.
- Dichloromethane and mixtures containing more than 0.1% dichloromethane were newly designated as restricted substances (code 06-5-15), specifically prohibiting their use in household cleaning agents and sprays, as well as paint removers for home, construction, and furniture applications.

Read More

CIRS, 17-10-24

<https://www.cirs-group.com/en/chemicals/south-korea-updates-list-of-restricted-and-prohibited-chemicals>

AMERICA

Title 40: Protection of Environment

2024-10-23

Chapter I: Environmental Protection Agency

Subchapter R: Toxic Substances Control Act

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Part 751: Regulation of Certain Chemical Substances and Mixtures Under Section 6 of the Toxic Substances Control Act

Subpart B: Methylene Chloride

751.111 Downstream notification.

8. After August 26, 2019, and before October 7, 2024, each person who manufactures (including imports), and before December 4, 2024 processes or distributes in commerce methylene chloride for any use must, prior to or concurrent with the shipment, notify companies to whom methylene chloride is shipped, in writing, of the restrictions described in § 751.105. Notification must occur by inserting the following text in section 1(c) and section 15 of the SDS provided with the methylene chloride or with any methylene chloride-containing product:
This chemical/product is not and cannot be distributed in commerce (as defined in TSCA section 3(5)) or processed (as defined in TSCA section 3(13)) for consumer paint or coating removal.

(b) Beginning on October 7, 2024, each person who manufactures (including import) methylene chloride for any use must, prior to or concurrent with the shipment, notify companies to whom methylene chloride is shipped, in writing, of the restrictions described in this subpart in accordance with paragraph (d) of this section.

(c) Beginning on December 4, 2024, each person who processes or distributes in commerce methylene chloride or methylene chloride-containing products for any use must, prior to or concurrent with the shipment, notify companies to whom methylene chloride is shipped, in writing, of the restrictions described in this subpart in accordance with paragraph (d) of this section.

(d) The notification required under paragraphs (b) and (c) of this section must occur by inserting the following text in section 1(c) and section 15 of the SDS provided with the methylene chloride or with any methylene chloride-containing product:

After February 3, 2025, this chemical substance (as defined in TSCA section 3(2))/product cannot be distributed in commerce to retailers. After January 28, 2026, this chemical substance (as defined in TSCA section 3(2))/product is and can only be distributed in commerce or processed with a concentration of methylene chloride equal to or greater than 0.1% by weight for the following purposes: (1) Processing as a reactant;

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(2) Processing for incorporation into a formulation, mixture, or reaction product; (3) Processing for repackaging; (4) Processing for recycling; (5) Industrial or commercial use as a laboratory chemical; (6) Industrial or commercial use as a bonding agent for solvent welding; (7) Industrial and commercial use as a paint and coating remover from safety critical, corrosion-sensitive components of aircraft and spacecraft; (8) Industrial and commercial use as a processing aid; (9) Industrial and commercial use for plastic and rubber products manufacturing; (10) Industrial and commercial use as a solvent that becomes part of a formulation or mixture, where that formulation or mixture will be used inside a manufacturing process, and the solvent (methylene chloride) will be reclaimed; (11) Industrial and commercial use in the refinishing for wooden furniture, decorative pieces, and architectural fixtures of artistic, cultural or historic value until May 8, 2029; (12) Industrial and commercial use in adhesives and sealants in aircraft, space vehicle, and turbine applications for structural and safety critical non-structural applications until May 8, 2029; (13) Disposal; and (14) Export.

[Read More](#)

US Code of Federal Regulations, 23-10-24

<https://www.ecfr.gov/current/title-40/chapter-I/subchapter-R/part-751/subpart-B/section-751.111>

Supreme Court Denies Requests to Block Climate Pollution Standards for Power Plants

2024-10-16

“The Supreme Court today rejected cynical requests to use its shadow docket to block EPA protections that will reduce the power plant climate pollution that threatens millions of people.

“People across America are suffering through intensifying storms and other disasters because of climate change. EPA – as specifically required by Congress – set reasonable and achievable standards to reduce the pollution that causes climate change from one of its largest sources, fossil fuel-burning power plants. Power plants have a wide variety of options to comply with the standards – options that are pollution-free, reliable, and cost-effective. The good news is that the clean solutions are the lowest-cost solutions.

“When judges on the U.S Court of Appeals for the D.C. Circuit, including a former senior Trump White House official, unanimously rejected requests

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for an emergency stay of EPA’s commonsense safeguards, opponents asked the Supreme Court to rule in their favor from its shadow docket – before any court could fully hear the case and weigh all the evidence. Today, the Supreme Court rejected that end run around our country’s bedrock legal processes.

“EPA’s protections will help address dangerous pollution, save people money, and create high quality jobs.”

[Read More](#)

Environmental Defense Fund, 16-10-24

<https://www.edf.org/media/supreme-court-denies-requests-block-climate-pollution-standards-power-plants>

American Cleaning Institute Refutes NGO Attacks on Safe, Effective Antibacterial Soap Ingredients

2024-10-03

ACI member manufacturers are actively conducting studies and working with the FDA to reinforce the safety and efficacy of these products.

The American Cleaning Institute (ACI) refuted recent comments made by activist groups challenging the safety and effectiveness of lawfully marketed antibacterial soaps and ingredients.

Contrary to the assertions raised by these groups, led by the Green Science Policy Institute in comments to the Food and Drug Administration (FDA), ACI and its members have been working expeditiously to gather the evidence FDA is requiring to demonstrate that these products are Generally Recognized as Safe and Effective (GRASE).

“American Cleaning Institute members continue to work diligently with the Food and Drug Administration and under its timelines on the FDA-required studies to establish GRASE status for antibacterial ingredients used in consumer soaps,” said James Kim, PhD, ACI Senior Vice President of Science & Regulatory Affairs. “Much research, such as in vitro efficacy assays and smaller clinical studies, have already been completed and/or published.

“For example, we have submitted Time-Kill efficacy data to FDA clearly demonstrating broad-spectrum antiseptic activity of the active ingredients in question. These ingredients are also registered for use in antimicrobial pesticides with EPA based on their safety and effectiveness.”

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“Antibacterial soaps are an important resource for consumers in their homes and in public settings, such as daycare centers, schools, airports and restaurants, for not only washing off germs as regular soap does, but in killing any remaining germs on hands,” said Dr. Kim. “While hand hygiene at key moments is important, regular soaps without an antibacterial ingredient remove germs, but do not kill the germs on hands – and for some consumers, they want or need soaps that kill germs.”

“ACI and its members are committed to providing consumers with antibacterial soap products that meet the highest safety and efficacy standards and will continue to work with the FDA to provide the science, research and data to support these products. We believe consumers should continue to have access to these important products as part of their hand hygiene routines.”

Read More

American Cleaning Institute, 03-10-24

<https://www.cleaninginstitute.org/newsroom/2024/american-cleaning-institute-refutes-ngo-attacks-safe-effective-antibacterial-soap>

EUROPE

The environmental cost of Europe’s hunt for lithium

2024-10-07

As the European Union accelerates its push for net-zero emissions, it is looking to boost lithium production across various member states. This essential mineral, crucial for electric vehicle batteries, has sparked interest in mining projects not just in Serbia, but across Portugal, Spain and France.

While lithium is a key component of the EU’s green transition, concerns are rising over the environmental impact of increased mining activities. Experts warn of water pollution, biodiversity loss, and heightened carbon emissions, raising questions about the sustainability of this green push.

Can Europe meet its ambitious climate goals without compromising the environment?

In this episode, host Giada Santana sits down with Energy and Environment reporter Nathan Canas to explore the continent’s expanding lithium production plans, the challenges that accompany them, and the

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broader implications for Europe’s sustainability efforts. Join us for a critical look at this pressing issue.

Read More

Euractiv, 07-10-24

<https://www.euractiv.com/section/eet/podcast/the-environmental-cost-of-europes-hunt-for-lithium/>

Europe has a duty to lead the green transition

2024-10-07

The next five years are crucial to the future of Europe. Reaching our 2030 target – namely, the reduction of greenhouse gases by 55% – will set the path for the following decades.

For those of us in the EPP block, which continues to be the largest grouping in the European parliament, this means a pan-European mandate for unity, ambition and growth.

Nowhere are these ideas more important than in the reformulation of the European Green Deal, and the way it can be a boost for both the environment and the economy. The next five years are crucial to the future of Europe.

Reaching our 2030 target - namely, the reduction of greenhouse gases by 55 per cent from where they were in 1990, will set the path for the following decades, with the ultimate aim of carbon neutrality by 2050.

But these targets will remain abstract if we’re not clear what they mean for people’s everyday lives and across Europe.

Firstly, our approach to the green transition necessitates a robust and growing economy.

Read More

Euractiv, 07-10-24

<https://www.euractiv.com/section/eet/opinion/europe-has-a-duty-to-lead-the-green-transition/>

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Enforcement 11/24: Inspection of fragrance oils and essential oils

2024-10-07

The Swedish Chemicals Agency has inspected 76 products from 30 companies that sell fragrance oils and essential oils. The project aimed to ensure that the products complied with current legal requirements concerning classification, labeling, and packaging, as well as verifying that the companies were registered with the Swedish Chemicals Agency's product register.

Fragrance oils and essential oils are often classified as hazardous according to the CLP Regulation. They may contain substances that, for example, are allergenic, flammable, and/or may be fatal if swallowed and enters airways. Since these products are sold to, and used by, consumers it is important that they are correctly classified and labeled so that customers receive accurate information about the hazards of the products. This allows them to make informed choices when purchasing and use the products safely.

The project revealed that many products had deficiencies that needed to be addressed; for example, some products lacked labeling entirely, the labeling did not indicate the correct hazards, the information was not in Swedish, and there was no tactile warnings or child-resistant fastening. Many of the companies selling these types of products are small and do not have sales of chemical products as their main business, and often have limited knowledge of the requirements of chemical legislation. Several companies believed that their products did not count as chemical products because the raw materials have a natural origin and therefore are not covered by chemical legislation, which is not correct. There may also be a misconception that all products made from natural raw materials are harmless, which is not the case.

Read More

KEMI, 07-10-24

<https://www.kemi.se/en/publications/enforcement-reports/2024/enforcement-11-24-inspection-of-fragrance-oils-and-essential-oils>

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INTERNATIONAL

New report lists measures to reduce emissions from consumption

2024-10-16

It's more effective to tighten policy measures that have already been introduced than to propose completely new ones if the goal is to reduce greenhouse gas emissions from our consumption. This is one of the key messages according to a new report by the Nordic Council of Ministers.

The report Policy Options for Reducing Consumption-Based Emissions lists around a hundred potential policy measures that could help reduce consumption-based emissions. Nordic researchers and experts analysed 21 of these measures that they deemed to be the most promising, and ultimately ranked 12 based on their feasibility and potential to reduce emissions.

At the top of the "ranking" are regulatory requirements and standards, i.e. rules and regulations which set limits for emissions, public procurement, and measures that reduce incentives for commuting by car to work.

Fair measures

The experts featured the report point out that it's easier to adjust policy measures that have already been implemented than to propose new ones. For example, lowering emission thresholds or increasing a tax could be effective ways to achieve results.

At the same time, the researchers argue that the measures must be perceived as fair by the public. Population groups which are disproportionately affected should be compensated.

However, the researchers stress that there is no single miracle solution and recommend that decision-makers work with multiple measures simultaneously. This could involve combining both a carrot and stick approach and ensuring that measures that make life more difficult or costly for people are paired with information that explains the purpose of the policy.

Action is needed

The researchers featured in the report agree that action is needed.

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"Although emissions of climate-impacting greenhouse gases in the Nordic countries have decreased over time, this reduction is too slow. And although we know that emissions must fall to near-zero in the coming decades, the current trend indicates that we won't succeed. Hopefully, this report will accelerate emission reductions," says one of the researchers behind the report, Dr. Markus Larsson from KTH Royal Institute of Technology.

Larsson presented the report at the Sustainable Living Summit in Stockholm on Tuesday. The conference marked the conclusion of the Nordic Council of Ministers' Sustainable Living programme, which has been funded by the Nordic Council of Ministers and was co-ordinated by the Nordic research institute Nordregio.

[Read More](#)

Nordic Co-operation, 16-10-24

<https://www.norden.org/en/news/new-report-lists-measures-reduce-emissions-consumption>

eBay Expands Circular Fashion Fund to Start-ups, Delivering \$1.2 Million Investment by the End of 2025

2024-10-16

- New for the 2025 cohort, eBay Ventures, eBay's venture capital arm, will reward one 'Circular Fashion Innovator of the Year' with an extra investment of \$300,000
- Since starting in 2022, the CFF is set to deliver a total investment of \$1.2 million by the end of 2025 as it expands in the UK, Germany, the US and Australia
- eBay partners with leading fashion industry councils the British Fashion Council, Council of Fashion Designers of America, Fashion Council Germany and the Australian Fashion Council, to extend the CFF's impact across the globe

eBay, a leading destination for new and pre-loved fashion and luxury, has announced today the global expansion of its Circular Fashion Fund. The fund is designed to help fashion start-ups scale circular solutions, from production to end-of-life, including rental and repair services. Applications are open from now until 15th November 2024, and innovative tech start-ups and small businesses can apply via eBay's website here.

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Since it launched in the UK in 2022, the CFF has helped 15 businesses scale their circular solutions, including The Seam, which allows businesses to offer garment care & repair services at scale to extend the life of clothes, and RCYCL, creators of the innovative at-home fashion recycling program for unwearable clothing. Now in its third year in the UK, the CFF is set to launch in the US and Germany for the first time having successfully expanded to Australia last year.

As part of eBay's commitment to the circular economy, the global expansion of the CFF extends its reach to invest in businesses that bring new technology and services to the market and help people think and shop differently. eBay is transforming the buying and selling experience so that more brands, sellers and buyers can participate in circular fashion.

The CFF will provide a global investment of \$1.2 million to start-ups in the global markets by the end of 2025, and over 200 hours of mentoring and networking support for applicants from industry experts. Past judges have included Hugo Adams, CEO Kelpi Sustainable Materials and KITX Founder Kit Willow. To further amplify its impact, eBay Ventures will select one winner from the global selection of finalists to become "Circular Fashion Innovator of the Year" and receive an investment of \$300,000.

Kirsty Keoghan, Global GM of Fashion at eBay, commented: "The Circular Fashion Fund is a catalyst for collaboration by combining the global scale and power of established companies like eBay with the creativity and innovation of nimble start-ups. We're not only helping to scale circular solutions but also bringing together the most knowledgeable and respected experts in the industry. Together, we're making a positive impact on the circular economy and truly reshaping the future of fashion."

[Read More](#)

eBay, 16-10-24

<https://www.ebayinc.com/stories/news/ebay-expands-circular-fashion-fund-to-start-ups-delivering-1.2-million-investment-by-the-end-of-2025/>

Emissions Gap Report 2024

2024-10-24

The persistent focus of the report this year is on the need and options to accelerate climate action and deliver global ambition levels aligned with the Paris Agreement temperature goals in the next generation of Nationally Determined Contributions, due in 2025.

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The Emissions Gap Report (EGR) is UNEP's annual institutional series report that is launched in advance of the annual climate negotiations. The EGR tracks the gap between where global emissions are heading with current country commitments and where they ought to be to limit warming to well below 2°C and pursuing 1.5°C in line with the Paris Agreement temperature goals. Each edition explores ways to bridge the emissions gap, tackling specific issue(s) of interest and relevance to the negotiations each year.

Read More

UNEP, 24-10-24

<https://www.unep.org/emissions-gap-report-2024>

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REACH Update

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ECHA's Integrated Regulatory Strategy achieves its goal – high production volume chemicals screened

2024-10-23

Helsinki, 23 October 2024 - The Integrated Regulatory Strategy (IRS) has increased our knowledge on chemicals and sped up identification of substances for which regulatory risk management actions are required. Refocused IRS 2024-2028 will continue moving substances to risk management.

ECHA's sixth and final report of its Integrated Regulatory Strategy 2019-2023 shows that it achieved its goal of screening high production volume chemicals, manufactured or imported above 100 tonnes per year, that were on the European markets in 2018.

Since 2019, ECHA has grouped and screened 6 000 substances, and addressed almost all of the 4 100 high production volume chemicals. Around 1 900 of substances screened in ECHA's assessments of regulatory needs may potentially require regulatory risk management, mostly harmonised classification and labelling (CLH) or restriction under REACH. For more than two thirds of those, further data is needed first to confirm the relevant hazards. Around 60 % of all substances screened did not require further action.

Several substance groups, identified as requiring regulatory risk management, have been included in the EU's Restrictions Roadmap, for example bisphenols, ortho-phthalates, flame retardants, hydrocarbyl siloxanes and hydrocarbylphenols.

Ofelia Bercaru, ECHA's Director of Prioritisation and Integration, said:

"The strategy has significantly contributed to the EU ambition towards reaching the United Nations' 2030 Sustainable Development Goals concerning chemicals. Over the next four years, we will continue the coordinated approach towards prioritising substances for risk management, whilst maintaining our good knowledge on ECHA's chemical database, enhancing transparency with authorities and stakeholders, and exploring synergies with ECHA's new tasks.

"This will allow us to continue to protect health and the environment through our work for chemical safety."

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Read More

ECHA, 23-10-24

<https://echa.europa.eu/-/echa-s-integrated-regulatory-strategy-achieves-its-goal-high-production-volume-chemicals-screened>

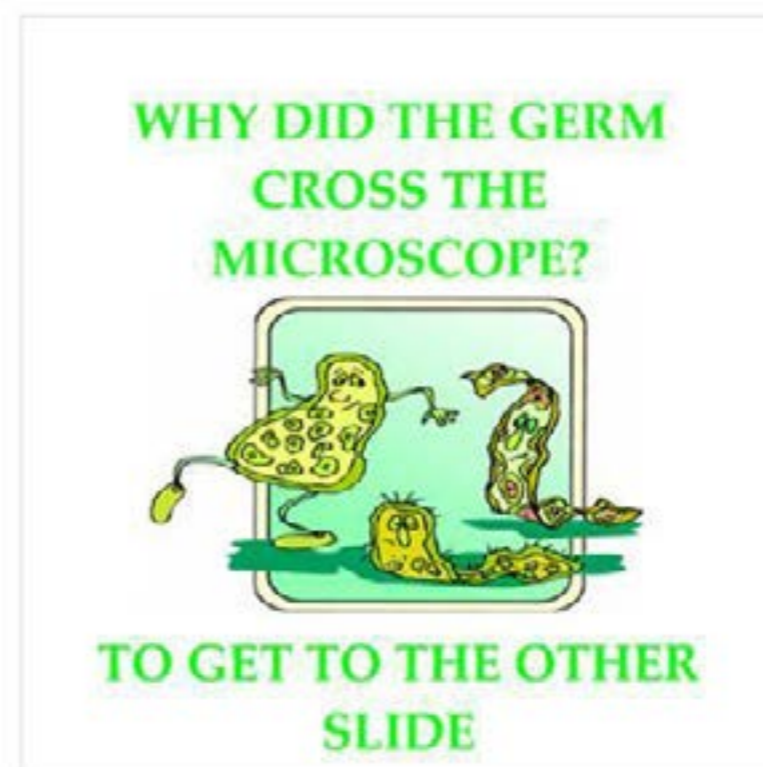
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The Germ and the Microscope

2024-11-01



https://www.zazzle.co.uk/germ_biology_research_joke_poster-228545479660746479?trchd=true

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Hazard Alert

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Phthalic Anhydride

2024-11-01

USES [2,3]

Phthalic anhydride is used in the manufacture of plasticisers, polyester and alkyd resins. It is also used in the manufacture of phthaleins, phthalates, benzoic acid, synthetic indigo, artificial resins, synthetic fibres, dyes, pigments, pharmaceuticals, and chlorinated products.

Phthalic anhydride is an important chemical intermediate in the plastics industry from which are derived numerous phthalate esters that function as plasticisers in synthetic resins. Phthalic anhydride itself is used as a monomer for synthetic resins such as glyptal, the alkyd resins, and the polyester resins. It is also used as a precursor of anthraquinone, phthalein, rhodamine, phthalocyanine, fluorescein, and xanthene dyes.

Phthalic anhydride is used in the synthesis of primary amines, the agricultural fungicide phaltan, and thalidomide. Other reactions with phthalic anhydride yield phenolphthalein, benzoic acid, phthalylsulfathiazole (an intestinal antimicrobial agent), and orthophthalic acid.

EXPOSURE SOURCES & ROUTES OF EXPOSURE [3]

Exposure Sources

- Exposure to phthalic anhydride may occur during the manufacture of phthalate-derived products.
- It has been suggested that exposure to phthalic anhydride may occur from the use of plastics from which phthalate plasticisers are leached, specifically certain medical plastics such as blood bags, plastic syringes, and plastic tubing.
- Phthalate esters have been identified as environmental pollutants.

Routes of Exposure

The probable routes of exposure to phthalic hydride are:

- inhalation;
- ingestion; and
- skin and/or eye contact

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HEALTH EFFECTS [4]

Acute Health Effects

- Phthalic anhydride is irritating to the eyes, respiratory tract, and the skin in humans, but no permanent injury is observed. Since phthalic anhydride has no effect on dry skin, but burns wet skin, it has been suggested that the actual irritant is phthalic acid, which is formed on contact with water.
- Tests involving acute exposure of rats have shown phthalic anhydride to have moderate acute toxicity.

Carcinogenicity

- No studies were available on the carcinogenic effects of phthalic anhydride in humans.
- A bioassay of phthalic anhydride for possible carcinogenicity was conducted by administering phthalic anhydride in feed to groups of male and female rats and mice. It was observed that no tumours occurred in the rats or mice of either sex at incidences that could be clearly related to the administration of phthalic anhydride.
- EPA has not classified phthalic anhydride regarding carcinogenicity.

Other Effects

- No studies regarding reproductive or developmental effects in humans were available.
- Phthalic anhydride was reported to be teratogenic in mice following intraperitoneal injection.
- Decreased spermatozoa motility time was reported in one study in which male rats were exposed via inhalation.

SAFETY

First Aid Measures [5]

- **Eye Contact:** Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.
- **Skin Contact:** In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing

Phthalic anhydride is the organic compound with the molecular formula C₈H₄O₃. It is the anhydride of phthalic acid. Phthalic anhydride occurs as white, lustrous crystalline needles, and has a characteristic pungent choking odour. It is soluble in hot water, benzene, carbon disulfide, and alcohol and is slightly soluble in water and ether. Phthalic anhydride is obtained by catalytic oxidation of ortho-xylene or naphthalene. When separating the phthalic anhydride from production by products such as o-xylene in water, or maleic anhydride, a series of "switch condensers" is required. It can also

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Hazard Alert

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- before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
- **Serious Skin Contact:** Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.
- **Inhalation:** If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
- **Serious Inhalation:** Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.
- **Ingestion:** Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Workplace Controls & Practices [4]

- Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits.
- If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protective Equipment [5]

The following personal protective equipment is recommended when handling phthalic anhydride:

- Splash goggles;
- Synthetic apron;
- Vapour and dust respirator (be sure to use an approved/certified respirator or equivalent);
- Gloves.

Personal Protective Equipment in Case of a Large Spill:

- Splash goggles;
- Full suit;

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- Vapour and dust respirator;
- Boots;
- Gloves;
- A self-contained breathing apparatus should be used to avoid inhalation of the product.
- Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

REGULATION

United States

NIOSH: The National Institute for Occupational Safety and Health has set a recommended exposure limit (REL) for phthalic anhydride of 6 mg/m³ and 1 ppm TWA

OSHA: The Occupational Safety & Health Administration has set a permissible exposure limit (PEL) for phthalic anhydride of 12 mg/m³ and 2 ppm TWA

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New Study Reveals That Eating Pistachios Could Improve Your Eye Health in Just 6 Weeks

2024-10-29

Daily pistachios boost eye health by raising lutein, protecting against age-related damage, and supporting brain function.

A recent study by researchers at Tufts University's Friedman School of Nutrition Science and Policy suggests that eating pistachios daily may greatly benefit eye health. This improvement is linked to an increase in macular pigment optical density (MPOD), thanks to lutein, a plant pigment that plays a crucial role in shielding eyes from blue light and age-related damage.

The randomized controlled trial showed that compared to eating a usual diet alone, eating 2 ounces (57 grams) of pistachios per day for 12 weeks as part of a usual diet resulted in a significant increase in MPOD in otherwise healthy middle-aged to older adults. MPOD is an important indicator of eye health, as it protects the retina and is linked to a reduced risk of age-related macular degeneration (AMD), a leading cause of blindness in older adults.

Findings from this research are timely, as according to a national poll by the American Foundation for the Blind, Americans fear vision loss more than they fear other serious health problems.

Key Findings

Increased MPOD: Participants who consumed pistachios daily saw a significant rise in MPOD after just 6 weeks, with the effect sustained throughout the 12-week study.

Natural Lutein Source: Pistachios are the only nut that provides a measurable source of lutein, a powerful antioxidant that helps protect the eyes.

AMD Prevention Potential: The study suggests that regular pistachio consumption could offer a natural dietary approach to reducing the risk of AMD.

"Our findings indicate that pistachios are not only a nutritious snack, but they may also provide significant benefits for eye health," said Dr. Tammy Scott, a research and clinical neuropsychologist and lead author of the study. "This is especially important as people age and face higher risks of vision impairment."

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Unique Role of Lutein from Pistachios and Eye Health

Lutein, found in pistachios, plays a critical role in maintaining eye health by filtering blue light and acting as an antioxidant in the eye. The study found that pistachio consumption nearly doubled participants' daily intake of lutein, which is typically very low in most American diets, and significantly raised plasma levels of lutein.

Dr. Scott explains that in the study, participants were selected to have low habitual baseline lutein intakes in their diet and just 2 ounces per day rapidly increased lutein levels in the blood in only 6 weeks. "By simply incorporating a handful of pistachios into your diet, you can improve your intake of lutein, which is crucial for protecting your eyes," notes Dr. Scott. She adds that pistachios provide a source of healthy fat, potentially making the lutein from pistachios better taken up into the body.

In the study, about 1.6 mg of lutein was provided from pistachios, which would be enough to double the average daily consumption of lutein, which is in a class of plant pigments known as xanthophylls, in U.S. adults.

Broader Health Benefits of Lutein

Beyond supporting eye health, the lutein found in pistachios may also benefit brain function. "Lutein crosses the blood-brain barrier, where it may help reduce oxidative stress and inflammation," notes Dr. Elizabeth Johnson, a co-investigator on the study.

As with the eye, lutein selectively accumulates in the brain and may play a role in reducing cognitive decline.⁵ Studies suggest higher lutein levels are associated with better cognitive performance, including memory and processing speed, making pistachios a valuable addition to a diet aimed at supporting overall healthy aging.

Sci Tech Daily, 29 October 2024

<https://scitechdaily.com>

Paper-aluminum combo can replace plastic for strong, sustainable packaging

2024-10-31

Takeout containers get your favorite noodles from the restaurant to your dining table (or couch) without incident, but they are nearly impossible to recycle if they are made from foil-lined plastics. Research published in ACS Omega suggests that replacing the plastic layer with paper could create

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a more sustainable packaging material. The researchers used mechanical demonstrations and computer simulations to identify paper-aluminum laminate designs that won't compromise on performance.

Protective packaging, like containers made from polyethylene and aluminum laminates, combines the strength and durability of plastic with the moisture- and light-blocking properties of aluminum foil. While these materials are effective, there's been a shift toward consumers desiring less plastic and more environmentally friendly materials in the packaging that comes into their homes.

To create such an option for protective packaging without sacrificing functionality, Hamed Zarei and colleagues designed a variety of paper-aluminum laminates and compared their strength and durability to common polyethylene-aluminum packaging.

First, Zarei's team manufactured two paper-aluminum laminates:

- A machine-direction (MD) laminate made from aluminum and paper with fibers that run parallel to the direction of machine loading (with the grain).
- A cross-direction (CD) laminate made from aluminum and paper with fibers that run perpendicular to the direction of machine loading (against the grain).

The researchers then compared the tensile strength of MD and CD paper-aluminum laminates to polyethylene-aluminum laminate by stretching samples of each material with gradually increasing force on laboratory machines. They also created a digital model, verified with their tensile strength data, that could replicate these laminate stretching tests and reliably predict the material's response under different scenarios.

In tensile strength tests, the polyethylene-aluminum laminate could be stretched further without breaking than both paper-aluminum laminates. And of the two paper-containing materials, the one made from MD paper could be stretched further but formed cracks along the paper's grain faster than the CD paper.

By running simulations of the MD, CD and a mixed MD/CD paper on their digital model, the researchers predicted that an aluminum film paired with a paper layer made from both MD and CD fibers would result in mechanical properties nearly identical to conventional polyethylene-aluminum laminate.

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While they haven't yet created the MD/CD paper-aluminum laminate in the lab, the researchers say this study provides packaging engineers with information to create sustainable materials that could perform like conventional options.

Phys Org, 31 October 2024

<https://phys.org>

Implantable microparticles can deliver two cancer therapies at once

2024-10-29

Patients with late-stage cancer often have to endure multiple rounds of different types of treatment, which can cause unwanted side effects and may not always help.

In hopes of expanding the treatment options for those patients, MIT researchers have designed tiny particles that can be implanted at a tumor site, where they deliver two types of therapy: heat and chemotherapy.

This approach could avoid the side effects that often occur when chemotherapy is given intravenously, and the synergistic effect of the two therapies may extend the patient's lifespan longer than giving one treatment at a time. In a study of mice, the researchers showed that this therapy completely eliminated tumors in most

"One of the examples where this particular technology could be useful is trying to control the growth of really fast-growing tumors," says Ana Jaklenec, a principal investigator at MIT's Koch Institute for Integrative Cancer Research. "The goal would be to gain some control over these tumors for patients that don't really have a lot of options, and this could either prolong their life or at least allow them to have a better quality of life during this period."

Jaklenec is one of the senior authors of the new study, along with Angela Belcher, the James Mason Crafts Professor of Biological Engineering and Materials Science and Engineering and a member of the Koch Institute, and Robert Langer, an MIT Institute Professor and member of the Koch Institute. Maria Kanelli, a former MIT postdoc, is the lead author of the paper, which appears in the journal ACS Nano.

Dual therapy

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Patients with advanced tumors usually undergo a combination of treatments, including chemotherapy, surgery, and radiation. Phototherapy is a newer treatment that involves implanting or injecting particles that are heated with an external laser, raising their temperature enough to kill nearby tumor cells without damaging other tissue.

Current approaches to phototherapy in clinical trials make use of gold nanoparticles, which emit heat when exposed to near-infrared light.

The MIT team wanted to come up with a way to deliver phototherapy and chemotherapy together, which they thought could make the treatment process easier on the patient and might also have synergistic effects. They decided to use an inorganic material called molybdenum sulfide as the phototherapeutic agent. This material converts laser light to heat very efficiently, which means that low-powered lasers can be used.

To create a microparticle that could deliver both of these treatments, the researchers combined molybdenum disulfide nanosheets with either doxorubicin, a hydrophilic drug, or violacein, a hydrophobic drug. To make the particles, molybdenum disulfide and the chemotherapeutic are mixed with a polymer called polycaprolactone and then dried into a film that can be pressed into microparticles of different shapes and sizes.

For this study, the researchers created cubic particles with a width of 200 micrometers. Once injected into a tumor site, the particles remain there throughout the treatment. During each treatment cycle, an external near-infrared laser is used to heat up the particles. This laser can penetrate to a depth of a few millimeters to centimeters, with a local effect on the tissue.

“The advantage of this platform is that it can act on demand in a pulsatile manner,” Kanelli says. “You administer it once through an intratumoral injection, and then using an external laser source you can activate the platform, release the drug, and at the same time achieve thermal ablation of the tumor cells.”

To optimize the treatment protocol, the researchers used machine-learning algorithms to figure out the laser power, irradiation time, and concentration of the phototherapeutic agent that would lead to the best outcomes.

That led them to design a laser treatment cycle that lasts for about three minutes. During that time, the particles are heated to about 50 degrees Celsius, which is hot enough to kill tumor cells. Also at this temperature,

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the polymer matrix within the particles begins to melt, releasing some of the chemotherapy drug contained within the matrix.

“This machine-learning-optimized laser system really allows us to deploy low-dose, localized chemotherapy by leveraging the deep tissue penetration of near-infrared light for pulsatile, on-demand photothermal therapy. This synergistic effect results in low systemic toxicity compared to conventional chemotherapy regimens,” says Neelkanth Bardhan, a Break Through Cancer research scientist in the Belcher Lab, and second author of the paper.

Eliminating tumors

The researchers tested the microparticle treatment in mice that were injected with an aggressive type of cancer cells from triple-negative breast tumors. Once tumors formed, the researchers implanted about 25 microparticles per tumor, and then performed the laser treatment three times, with three days in between each treatment.

“This is a powerful demonstration of the usefulness of near-infrared-responsive material systems,” says Belcher, who, along with Bardhan, has previously worked on near-infrared imaging systems for diagnostic and treatment applications in ovarian cancer. “Controlling the drug release at timed intervals with light, after just one dose of particle injection, is a game changer for less painful treatment options and can lead to better patient compliance.”

In mice that received this treatment, the tumors were completely eradicated, and the mice lived much longer than those that were given either chemotherapy or phototherapy alone, or no treatment. Mice that underwent all three treatment cycles also fared much better than those that received just one laser treatment.

The polymer used to make the particles is biocompatible and has already been FDA-approved for medical devices. The researchers now hope to test the particles in larger animal models, with the goal of eventually evaluating them in clinical trials. They expect that this treatment could be useful for any type of solid tumor, including metastatic tumors.

Science Daily, 29 October 2024

<https://sciencedaily.com>

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Chemo-biological process overcomes drawbacks of waste plastic pyrolysis

2024-10-31

A joint research team has developed a technology to produce high-value-added plastic raw materials called dicarboxylic acids (α,ω -diacids) by recycling mixed waste plastics. The work is published in the Journal of Cleaner Production.

The team was led by Dr. Sang-Goo Jeon from the Bioenergy and Resources Upcycling Research Laboratory at the Korea Institute of Energy Research (KIER) and Dr. Jung-Oh Ahn from the BioProcess Engineering Center at the Korea Research Institute of Bioscience and Biotechnology (KRIBB)

Plastics are produced from fossil fuels like petroleum and natural gas, and waste plastics are recycled by shredding and melting them to make new products. However, during the production and processing stages, wastewater and harmful substances are released, causing serious environmental impacts.

To address these problems, many countries and companies are striving to establish a plastic circular economy. In particular, technologies that recycle plastics in an environmentally friendly manner through chemical methods such as pyrolysis are gaining attention recently.

However, the pyrolysis method is not a perfect solution either. This is because only 30% of the naphtha component in the pyrolysis oil produced during pyrolysis is recycled as raw material for plastics, while the majority is utilized as low-grade fuel that emits greenhouse gases during combustion.

The Korean research team proposed a chemo-biological process that combines chemical and biological methods to overcome the limitations of traditional chemical recycling techniques. Instead of using pyrolysis oil as a low-grade fuel, the developed process purifies it into normal paraffins which serve as raw materials for microbial reactions and utilizes them as feedstock for microorganisms to produce plastic raw materials.

By utilizing the chemical pretreatment technology developed by the Korea Institute of Energy Research (KIER), it is possible to selectively purify only normal paraffins from pyrolysis oil. When the pyrolysis oil reacts with a catalyst in a high-temperature environment at 400°C filled with hydrogen, impurities and toxic substances are removed, converting it into normal paraffins.

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After the purified normal paraffins are utilized as food for microorganisms, they are ultimately converted into dicarboxylic acids—high-value-added plastic raw materials used in products like polyester (PES), polyamide (PA), and polyurethane (PU).

The research team predicted that utilizing this technology could reduce the production cost of plastic raw materials by up to 40% compared to existing petrochemical-based production technologies. Additionally, by recycling 30% of the pyrolysis oil that is typically used as low-grade fuel into plastic raw materials, it offers advantages for national greenhouse gas reduction.

Dr. Jeon stated, "This technology overcomes the limitations of existing chemical plastic recycling methods and is an achievement that can greatly contribute to establishing a plastic circular economy and realizing carbon neutrality. We are currently conducting verification procedures for synthesizing plastics using the dicarboxylic acids produced, and we plan to pursue technology transfer and commercialization through collaboration with interested companies."

Phys Org, 31 October 2024

<https://phys.org>

Microbubbles activate C–H bonds, converting methane into ethane and formic acid

2024-10-23

Microbubbles can activate C–H bonds in methane under mild conditions to produce ethane and formic acid. That's according to new research led by Richard Zare of Stanford University in the US.

Recent years have seen Zare's team devote itself to showing how water microdroplets can dramatically accelerate chemical reactions and trigger chemical transformations that do not occur in bulk water. Now, the team has turned its attention to microbubbles.

'I regard gas microbubbles in water to be inside-out water microdroplets,' explains Zare. 'In normal microdroplets, the water and whatever is dissolved in the water is on the inside and the gas is on the outside. In inside-out microdroplets, that is, microbubbles, the gas is on the inside and water and whatever is dissolved in the water is on the outside.'

In this new research, they show that water microbubbles can spontaneously oxidise methane. Their experimental set up combines

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a circulating water pump, a sealed reaction vessel and a microbubble generator. The reaction gas – in this case methane – is drummed into the reaction vessel for 30 minutes prior to the start of the reaction to displace the original gas in the vessel. Deionised water flows at high-speed through the microbubble generator, reducing the internal pressure of the system. Consequently, gas in the reaction vessel enters the microbubble generator and is then released as microbubbles into the water.

The team conducted initial experiments to test the oxidative capabilities of their microbubble system. They spiked deionised water with the probe 10-acetyl-3,7-dihydroxyphenoxazine, which is easily oxidised to the highly fluorescent compound resorufin. Fluorescent microscope images reveal the formation of bubbles with diameters smaller than 50µm and also confirm that these microbubbles possess oxidative capabilities. They then used analytical techniques including electron spin resonance, high-resolution mass spectrometry and gas chromatography to demonstrate the overall stability and efficiency of the microbubble system. Further experiments showed that this microbubble system was stable over a continuous period of eight hours and could achieve a methane activation rate of up to 6.7% per hour.

Zare says the chemistry of microbubbles is similar to that of water microdroplets: 'The common theme is that the air-water interface is where the action is.' Hydronium ions and hydroxide ions are thought to undergo electron transfer due to partial solvation effects and an electric field at the air-water interface. This generates hydrogen radicals and hydroxyl radicals that sequentially activate methane to form methyl radicals. The free radicals combine at the air-water interface to furnish ethane and formic acid. 'Once you have radicals, then you have a symphony of chemistry,' exclaims Zare.

'These findings deepen our understanding of the physical chemistry of gas-liquid interfaces,' comments AJ Colussi, a physical chemist at Caltech in the US. He finds it interesting that hydroxide and hydronium ions also exchange electrons on the surface of ascending bubbles, rather than recombining as in bulk water. 'Since energy is required to inject bubbles at the bottom of a water column, what is missing from this work is an assessment of the energy efficiency of these experiments for oxidising methane relative to more conventional methods. The assessment is essential regarding the realism of the scalability proposal,' Colussi adds.

'It costs much less energy to bubble a gas through water than to spray water into a gas. This gives hope that these processes might

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be economically scaled up to an industrial level rather than be just a laboratory curiosity,' concludes Zare.

Chemistry World, 23 October 2024

<https://chemistryworld.com>

Researchers Identify Gene Behind HIV Vaccine Ineffectiveness

2024-10-31

Researchers identified a gene that could hinder HIV vaccine efficacy, paving the way for more effective treatments.

Continuing their journey to develop a vaccine for HIV, Oregon Health & Science University researchers have identified a gene that could have prevented their vaccine from working in humans.

The study, published Oct. 11 in *Science Immunology*, removes one more barrier to developing a vaccine for HIV, and potentially other diseases such as malaria and cancer.

Daniel Malouli, Ph.D., assistant professor in the OHSU Vaccine and Gene Therapy Institute and lead author on the study, said the research team looked at whether human cytomegalovirus, or HCMV, has additional genes that could prevent a particular immune response which would keep their vaccine from working against HIV. In previous studies, the team's research with nonhuman primates showed that vaccines based on rhesus CMV, called RhCMV, trigger unique T cell responses not seen with any other vaccine. They found that these unique immune responses are essential for rhesus CMV-based vaccines to be effective against SIV, the pathogen most used to model HIV/AIDS in nonhuman primates.

"To develop an equivalent vaccine for clinical trials, we need our HCMV-based vaccines to induce similar T cell responses in humans," Malouli said.

Human and rhesus CMV are similar, and in past studies, OHSU researchers at the OHSU Vaccine and Gene Therapy Institute discovered that rhesus CMV needs certain genes turned off to trigger these unique immune responses. This is the result of decades of work by the research team led by VGTI associate director Louis Picker, M.D., and professors Klaus Früh, Ph.D., and Scott Hansen, Ph.D. The group has been working on developing this vaccine platform since the early 2000s, and in 2016, their OHSU startup company, TomegaVax, was acquired by San Francisco-based Vir Biotechnology. The company is currently testing the platform in a human

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clinical trial for HIV, together with the National Institutes of Health and the Bill and Melinda Gates Foundation. Früh, Picker and Hansen are corresponding authors on the new publication.

Malouli did graduate work with Früh in 2007, where he researched attenuation strategies of rhesus CMV-based vaccine vectors. Later, he joined Picker's lab as a staff scientist to study how rhesus CMV affects T cell responses and improve the design of the CMV vaccines so they can be tested in human clinical trials. He now has his own lab at OHSU's VGTI.

For this study, the researchers inserted 41 human CMV-specific genes into rhesus CMV and observed the immune responses in the non-human primates.

"We found that rhesus CMV expressing a specific human CMV gene, UL18, only triggered standard responses because UL18 interacts with an inhibitory receptor on T cells that blocks their reprogramming," Malouli said.

As a result of this research, Früh said the team has designed a human CMV-based vaccine for HIV that doesn't include UL18 or other genes that could potentially stop the vaccine from working in human patients.

"Our goal is to create a new kind of vaccine not just for HIV, but also for cancer and other diseases," Früh said.

Malouli added, "This CMV vector system invented at OHSU is unique. The applicability of our vector system to other diseases is endless."

Human clinical trials of the HIV vaccine, with the UL18 omitted, are now underway by Vir Biotechnology and the NIH, with additional support from the Bill and Melinda Gates Foundation.

Technology Networks, 31 October 2024

<https://technologynetworks.com>

Metallic luster material can change color from silver to gold under UV light

2024-10-30

There have been many attempts to create monochromatic metallic materials, but few materials change luster color in response to external stimuli. In a recent breakthrough, researchers from Chiba University have

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prepared a diacetylene derivative-based metallic luster material that changes from silver to gold under UV irradiation.

These findings are expected to find applications in decorative items, printing inks, photomask patterning, UV laser lithography, and cosmetics.

Societies of the past and present have given high regard to precious metals like gold and silver. Both metals remind us of nobility and luxury. However, they are quite expensive, which restricts their applications. Therefore, materials with attractive but artificial gold- and silver-like metallic lusters are popular, finding use in jewelry, reflective materials, inks, and cosmetics.

Unfortunately, typical metallic luster materials cause environmental harm, rendering them unsustainable. Thus, scientists are actively searching for metal-free alternatives, examining organics such as thiophene, pyrrole, porphyrin, azobenzene, and stilbene derivatives. They have found some success in creating materials whose colors can be tuned by external stimuli while maintaining the metallic luster. However, the task still remains challenging.

Recently, a group of researchers from Chiba University, led by Professor Michinari Kohri and Kyoka Tachibana from the Graduate School of Engineering, in collaboration with scientists from Mitsubishi Pencil Co., Ltd., Tokyo University of Science, Keio University, and Yamagata University, has demonstrated the preparation of a metallic luster material that changes color from silver to gold under UV irradiation.

Their findings were published in ACS Applied Materials & Interfaces on September 14, 2024.

Highlighting the motivation behind this study, Prof. Kohri says, "Expanding on our earlier findings on biomimetic metallic luster materials, we conducted a targeted search for molecular structures capable of transitioning between silver and gold. This effort resulted in the identification of a novel material with desirable properties."

In this study, researchers developed diacetylene (DA) derivative-based luster materials incorporating stilbenes via linkers at both ends, denoted as DS-DAn (where n represents the linker carbon number, ranging from 1 to 6). Varying n yielded diverse metallic luster and color change behaviors.

After several innovative experimental trials, the researchers observed that the stacked structure of platelet crystals comprising DS-DA1, the derivative with the shortest linker carbon chain, had a silver look. Its

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luster notably turned to gold upon UV irradiation, a remarkable external stimulus-based behavior.

The team attributed this to the unique crystal structure of DS-DA1 with two coexisting assembled states, revealing that partial topochemical polymerization (a polymerization method performed by monomers that are aligned in the crystal state) of DA within the structure modified its color tone from silver to gold.

The silver luster material developed in this study can express a golden luster selectively in specific areas using only light irradiation. It is also possible to add gradation colors of gold and silver. Thus, it has the potential to be useful in a variety of applications, such as decorative items, printing inks, and cosmetics.

“By eliminating metal components, our innovative material minimizes environmental footprint and weight. Moreover, its suitability for UV laser-based drawing techniques opens up new possibilities for high-end decorative printing. Further exploration of molecular structures may make it possible to express a wider variety of glossy colors,” concludes Prof. Kohri.

This work advances the fundamental science of DA polymerization and unlocks new opportunities for metallic luster materials with desirable properties in photomask patterning and UV laser lithography.

Phys Org, 30 October 2024

<https://phys.org>

Chemist found to have falsified data in 42 papers has notched up 13 retractions so far

2024-10-25

An analytical chemist at Japan's National Institute of Advanced Industrial Science and Technology (AIST) has had at least 13 papers retracted after an extensive investigation revealed widespread scientific misconduct in his research.

Naohiro Kameta is a senior principal researcher at the Nanomaterials Research Institute based on AIST's Ibaraki campus where he has worked for a number of years developing interfacial nanomaterials based on supramolecular and colloidal chemistry.

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According to a translation of the investigation, AIST was initially contacted on 24 November 2022 regarding suspected falsification of figures in a paper. The preliminary investigating committee initially examined five of Kameta's papers but, in light of the fact he had been publishing for many years, decided to carry out a wider investigation of 61 papers published between 2005 and 2022 in which he was the first or corresponding author.

Overall, they found specific misconduct in the form of fabrication and falsification in 42 papers, with inappropriate authorship in a further two. Fraudulent acts identified included showing scale bars in figures as longer or shorter than they actually were and cutting out a portion of an electron micrograph and passing it off as a different structure.

Following a comprehensive set of interviews with Kameta and his co-authors it was concluded that Kameta was solely responsible for the research misconduct.

The investigating committee recommended that Kameta and his co-authors ask the publishers to retract all 42 papers in which specific misconduct was found to have been committed.

According to Retraction Watch, 13 of the 42 papers have been retracted so far. In one of these, published in the Royal Society of Chemistry's journal *Chemical Communications* and retracted on 3 October, the authors state that they retracted the article 'due to the fact that the paper has wrong electron microscopy images' in five of the paper's figures. In one of the figures there was an 'incorrect image' which also included 'a serious error with the scale bar length, which was approximately 1.7 times shorter than the actual'.

'The authors respectfully retract this paper, because these events were determined to amount to scientific misconduct and the retraction of this paper was recommended by AIST,' Kameta and his co-author Hidenobu Shiroishi wrote in the retraction notice. 'AIST verified that the first author [Kameta] was responsible for the misconduct and the other co-author was not engaged in the misconduct.'

AIST's investigation report also details the expenses and research projects in which the misconduct occurred, highlighting that Kameta received numerous grants from the Japan Society for the Promotion of Science between 2010 and 2022 totalling almost ¥33 million (£168,663). The Japan Society for the Promotion of Science has since demanded the return of the funding.

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According to Retraction Watch, Kameta has been dismissed from his role at AIST.

Chemistry World, 25 October 2024

<https://chemistryworld.com>

Vitamin K2 reduces night leg cramps by 50% in large clinical trial

2024-10-30

If you've ever woken up in the middle of the night with sudden painful thigh, calf or foot cramping, you'll know just how awful the experience is – and, unfortunately, the frequency of these nighttime disturbances increases with age.

Around 40% of people over 50 experience night cramps – known by many names, such as sleep or nocturnal leg cramps (NLCs) – in which muscles in the lower limbs contract painfully and that can take up to several minutes to recede. However, only a minority of sufferers report them to their doctor.

Now, researchers from the Third People's Hospital in China and several medical colleges have found a promising preventer for these waking nightmares, and a clinical trial of 199 people found that vitamin K2 significantly reduced episodes, pain experienced and the duration of the cramping.

"This study was based on our previous research, which revealed the efficacy of vitamin K2 in relieving hemodialysis-related muscle cramps," the researchers noted. "To our knowledge, this is the first study that explored the use of vitamin K2 specifically for treating NLCs."

Until now, lifestyle interventions – exercise, hydration – have been an imperfect way to reduce the chances of experiencing frequent NLCs, which become more frequent as we age and are often independent of any underlying diseases or conditions. While magnesium supplements have shown some efficacy in relieving cramping in pregnant women, it didn't help NLCs in general.

Overall, while a less active lifestyle and poor diet and lifestyle plays a role in the condition, it's not well understood nor treated.

"Quinine has been shown to be effective in treating NLCs but is not recommended by the US Food and Drug Administration due to severe side

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effects," the researchers noted in a preliminary study protocol paper last year. "Magnesium supplements are often used as a preventative treatment for NLCs; however, their effectiveness is controversial."

Controversial, because trials have not delivered clinically significant results for older adults who experience NLCs.

In this eight-week study, 199 participants aged 65 or older with a minimum of two NLCs in two weeks were recruited for a randomized, double-blind, placebo-controlled trial to test whether vitamin K2 could be a better intervention.

Splitting the group in two, 103 participants were randomly assigned to take a daily dose of 180 µg of K2, with the remaining 96 people receiving the placebo. Overall, 54% were female and the average age was 72.

So why this particular isoform of vitamin K? K2, a group of menaquinones synthesized by bacteria in the gut, is bioavailable in dairy products like full-fat cheeses, fermented foods such as sauerkraut and other animal products (as opposed to K1, a phyloquinone, which you'll find in leafy greens and certain plant oils). Vitamin K, overall, is important in blood coagulation, as well as general blood and bone health.

While K2 has shown potential in helping reduce the risk and morbidity of certain cancers, it's largely understudied and its broad health benefits are not well understood.

During the clinical trial – patients were assessed weekly for occurrence and severity of NLCs, and both cohorts had a similar baseline number of events, with 2.60 in the K2 group and 2.71 in the control. At the end of the eight-week experiment, weekly scores were analyzed to see if there had been a sustained benefit to the K2 treatment.

What the team found was that over the eight weeks, the participants taking K2 showed a statistically important reduction in NLCs, with a mean of 1.41. The control group, meanwhile, had a mean of 3.63 with a much greater range in number of events than the K2 group.

"The difference in cramp frequency at intervention phase between the vitamin K2 and placebo groups was statistically significant," the researchers noted. "The between-group difference became significant since the first week of the intervention."

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The K2 group also had a greater reduction of pain and episode duration than the placebo cohort, and no negative side effects were experienced by those taking the supplement.

“Our results demonstrated that daily vitamin K2 supplementation alleviates muscle cramps in older individuals affected by NLCs, manifested by decreased frequency, shortened duration, and weakened intensity,” the researchers added.

They also noted trial limitations, such as not assessing overall quality of life and sleep, and many participants experienced mild NLCs. Future studies should take these into account to confirm vitamin K2’s efficacy as a treatment for the condition.

While K2 supplements, when taken within dose range, are considered low-risk when it comes to side effects, some people have reported initial mild digestive issues like bloating or gas, or headaches.

The team cautions that anyone should consult a medical professional before taking new supplements, as K2 could present issues for people on other medications, including anticoagulant treatments.

The study was published in the journal JAMA Internal Medicine.

New Atlas, 30 October 2024

<https://newatlas.com>

Physicists may now have a way to make element 120 – the heaviest ever

2024-10-23

A method that helped create two atoms of the rare, super-heavy element livermorium may pave the way towards making the hypothetical element 120

The third-heaviest element in the universe has been made in a way that offers a route for synthesising the elusive element 120, which would be the heaviest element in the periodic table.

“We were very shocked, very surprised, very relieved that we didn’t make any bad choices in setting up the instrumentation,” says Jacklyn Gates at Lawrence Berkeley National Laboratory (LBNL) in California.

She and her colleagues created the element livermorium by smashing a beam of charged titanium atoms into a piece of plutonium. Titanium

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has never been used in such an experiment because it is tricky to turn it into a well-controlled beam and it takes millions of trillions of collisions to produce very few new atoms. Yet, physicists think a titanium beam will be crucial for creating the hypothetical element 120, also known as unbinilium, which would have 120 protons in its nucleus.

The researchers started with rare isotopes of titanium, which they vaporised in a special oven at 1650°C (around 3000°F). Next, they used microwaves to turn the hot titanium vapour into a charged beam, which could then be fed into a particle accelerator. When the beam reached roughly 10 per cent of the speed of light and collided with the plutonium target, the resulting debris hit a detector that revealed signatures of exactly two atoms of livermorium.

Each atom rapidly decayed into other elements, as was expected – the stability of atomic nuclei decreases as the mass of an atom increases. But the measurement was so precise that there is only about a one in a trillion chance that the finding was a statistical fluke, says Gates. The researchers presented their findings on 23 July at the Nuclear Structure 2024 conference at Argonne National Laboratory in Illinois.

Michael Thoennessen at Michigan State University says this experiment strengthens the case for the feasibility of creating element 120. “You have to do the groundwork and feel your way up to it. In this sense, this is a really important and necessary experiment,” he says.

Thoennessen says that creating unbinilium would have deep implications for our understanding of the strong force, which determines when heavy elements are stable or not. Studying unbinilium could also help us understand how exotic elements may have formed in the early universe.

The heaviest human-made element so far – element 118, also known as oganesson – has two more protons than livermorium and was first synthesised in 2002. In the intervening years, researchers have struggled to make atoms any heavier because that requires smashing together already very heavy elements, which tend to be unstable themselves. “This is really, really difficult business,” says Thoennessen.

But the new experiment makes the LBNL researchers optimistic. They plan to start the experiment aimed at creating element 120 in 2025, once they have replaced the plutonium target with the heavier element californium.

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"I think we're a lot closer to knowing what we have to do," says Gates. "And having the chance to put a new element on the periodic table [is exciting]. So few people have that opportunity."

New Scientist, 23 July 2024

<https://newscientist.com>

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Scientists develop revolutionary 'fully natural solution' to remove harmful substances from water: 'This could really have a major impact'

2024-10-04

Researchers have created a potential solution to "forever chemicals" in our water supply, which could go a long way toward cleaning our water of a particularly stubborn problem.

According to Interesting Engineering, scientists at MIT have developed a new material made from silk and cellulose that has shown incredible promise when it comes to removing per- and polyfluoroalkyl substances, or PFAS, from water.

PFAS are notoriously difficult to remove from water and don't break down naturally. A 2019 study using data from the National Health and Nutrition Examination Survey noted that 98 percent of Americans surveyed had PFAS in their bloodstream.

Led by postdoctoral researcher Yilin Zhang, MIT researchers realized that processing silk into uniform nanoscale crystals — known as nanofibrils — and then combining them with cellulose, a common material found in wood pulp waste, creates a material uniquely well suited to water filtration.

"Contamination by PFAS and similar compounds is actually a very big deal, and current solutions may only partially resolve this problem very efficiently or economically," Zhang said, "That's why we came up with this protein- and cellulose-based, fully natural solution."

On top of being effective at removing PFAS and heavy metals from water, the new material has "strong antimicrobial properties," meaning it can be used for extended periods of time without becoming contaminated and needing to be replaced.

The new material would likely first be used as a point-of-use filter, like one attached to a kitchen faucet or filter jug. In the future, it could be scaled up to municipal filtration systems, but it needs further testing to ensure it doesn't add other harmful chemicals to the water supply while removing PFAS.

College of William and Mary researcher Hannes Schniepp, who was not involved in the creation, praised the innovation for its simplicity.

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"In competing approaches, synthetic materials are used — which usually require only more chemistry to fight some of the adverse outcomes that chemistry has produced," Schniepp said, adding that this work "breaks this cycle."

"... If this can be mass-produced in an economically viable way, this could really have a major impact."

Yahoo, 4 October 2024

<https://yahoo.com>

Graphene oxide sponge soaks up gold from electronic waste

2024-10-30

A self-assembled composite of graphene oxide and chitosan can capture gold from electronic waste many times more efficiently and selectively than existing materials, researchers in Singapore have shown. The material could potentially eliminate several purification steps and make industrial recycling more economically competitive.

Because of the inertness of gold, its mining has a significant environmental footprint, usually requiring toxic chemicals such as mercury or cyanide to extract it from other components of the ore. This stability, together with its high electrical conductivity and ductility, makes it useful in electronics. Recycling gold to reduce mining faces the same extraction problems. Unwanted components are decomposed using one of several possible processes such as immersion in aqua regia (a concentrated mixture of hydrochloric acid and nitric acid). This yields a mixture of gold(I) and gold(III) ions mixed with copper, nickel, zinc and many others. 'Now electrolysis is used,' says Daria Andreeva at the National University of Singapore; 'Electrolysis is a very long process that can take days or even weeks, so it's a very interesting approach to look at how to make [separation] more efficient from an energy or time point of view.'

In previous work, Andreeva and colleagues led by Kostya Novoselov – who shared the 2010 Nobel prize in physics with Andre Geim for his work on graphene – developed self-assembled membranes from graphene oxide and other materials for applications ranging from tunable water filtration to corrosion prevention. In the new work, the researchers combined a solution of chitosan with a dispersion of graphene oxide flakes. When freeze dried, it formed a sponge-like material with ion-binding sites that could selectively capture and reduce both gold(I) and gold(III) ions –

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which must usually be extracted separately. Their material demonstrated substantially higher capacity to adsorb both ions: previous adsorbents have captured around 0.3g gold(I) and 2g gold(III) per gram of adsorbent – theirs captured 6.2g gold(I) and 16.8g gold(III).

Moreover, their material did not require an electrical input – the material could donate sufficient electrons. 'It's a two-stage process,' explains Novoselov. 'The ions adsorb fairly tightly, but then we reduce them into the metallic state and we get nanocrystals of gold. These nanocrystals are not chemically adsorbed but only van der Waals adsorbed, so it is easier to remove them.' The researchers are now working to develop a better understanding of the mechanism and to improve the specificity for gold still further. 'In e-waste there is a thousand times more copper than there is gold,' says Novoselov. 'So while this is better than traditional materials, it's still an open question whether it's good enough for industry.'

'This is really good,' says Yang Su at Tsinghua University in China, who in 2022 co-authored a paper with Geim and others on gold extraction using reduced graphene oxide. 'The adsorption capacity is astonishingly high.' He notes the paper 'shows us that there are a lot of things we didn't know before about graphene systems and their chemistry'. He says he will be interested to see more detailed theoretical modelling of how the system can supply enough electrons to reduce so many gold cations with no applied voltage. He also hopes similar ideas might be useful in other metals, pointing out that if electric vehicles take over there will be a lot of unwanted platinum in catalytic converters to recycle.

Chemistry World, 30 October 2024

<https://chemistryworld.com>

Australia's top neurologists call for chemical regulator to ban paraquat herbicide over links with Parkinson's disease

2024-10-28

Dozens of pre-eminent neurologists in Australia are calling on the chemical regulator to ban paraquat, a controversial herbicide that has been linked to the development of Parkinson's disease.

Paraquat is a widely used weedkiller and has been under review by the Australian Pesticides and Veterinary Medicine Authority for 27 years.

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In August, a proposed regulatory decision was released recommending tighter restrictions on the chemical's use, with public consultation closing on October 29.

WA-based neurologist David Blacker has amassed more than 40 signatures from colleagues in clinical neurology, including 31 neurologists, eight movement disorders specialists and 10 professors, joining his submission to the APVMA.

The ABC can also reveal the Movement Disorder Society of Australia and New Zealand (MDSANZ), as well as other world leading-scientists, have made submissions to the review, supporting calls for paraquat to be banned.

Dr Blacker said the quorum of doctors that signed his submission added weight to the growing evidence linking paraquat to Parkinson's disease.

Parkinson's is a progressive brain disorder that affects the nervous system. Symptoms generally develop over years and can affect movement, sleep, mental health and cognitive function.

In 2018, Dr Blacker himself was diagnosed with early onset Parkinson's disease, which he suspects could be in part linked to his exposure to agricultural chemicals while growing up in the Western Australian Wheatbelt.

"People joke about doctors' handwriting — for me, it became very difficult. I could look back in the patient files and see what my writing was like months and years before, and I could clearly see a change," he said.

"It really kicked me when I was examining the movements of Parkinson's patients in the clinic, they were doing better than me."

Dr Blacker's diagnosis led to an intense interest in the suspected origins of the disease.

"The literature over the last few years has really been very suggestive that environmental factors, including exposure to toxins, air pollution and most notably, pesticides, is perhaps playing a key role," he said.

Medical specialists say evidence on paraquat 'warrants immediate action'

In his submission, Dr Blacker and his colleagues have called on the APVMA to take swift action.

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"What I would like them to do is listen to the experts in health," he told the ABC.

"It's not just an agricultural problem, it's a health problem, and it's also an environmental problem.

MDSANZ president Carolyn Sue is a world renowned expert in movement disorders. In a submission to the regulator, she described the paraquat situation as a critical public health issue.

"The evidence supporting this connection is compelling and warrants immediate action to protect public health," she wrote.

"The health risks associated with this herbicide far outweigh any potential benefits, and alternatives are available that do not pose such severe threats to human health."

Dr Sue told the ABC her organisation felt it was past time to speak up.

"This is a very clear case where environment exposures in epidemiological studies have brought up the association of their exposure to the development of Parkinson's disease," she said.

The Australian and New Zealand Association of Neurologists (ANZAN) is also supporting MDSANZ call to ban paraquat, calling Australia an "outlier."

Dr Blacker, a clinical professor and noted expert in his own field, said it was reassuring to be backed by these leading peak bodies.

"To have the highest level of expert endorsing this data really means that I'm not acting like a maverick," he said.

Grain growers say risks can be managed

Pete Arkle, interim CEO of Grain Producers Australia (GPA), said the continued use of paraquat was critical to maintain sustainable farming practices in Australia.

"Australian grain farmers are some of the most efficient in the world at turning soil moisture into the food we rely on," he said.

Mr Arkle says top soil would be lost if farmers had to revert to ploughing fields to control weeds.

"The last thing we want to see is to go back to that widespread ploughing that we know did lead to dust storms, and did lead to sedimentation of rivers," he said.

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Mr Arkle said the industry acknowledged the safety concerns around paraquat, and was determined to see the rules tightened around the safe handling of the herbicide, including high levels of personal protective equipment and closed-looped transfer systems that reduce exposure.

“Four OECD pesticide regulators in the last five years have looked at this question, including the APVMA, and all four of those regulators have concluded that there is no causal link between paraquat and Parkinson’s,” he said.

The leading farm peak body, the National Farmers Federation (NFF), declined the ABC’s request for an interview, but said in a statement that it supported the APVMA’s process.

“Paraquat is one of many products that allow Australian farmers to grow high quality, safe and sustainable produce in the face of an increasingly volatile climate and growing demand for food and fibre,” it said.

“The NFF unequivocally supports the APVMA as Australia’s world-leading independent, science-based regulator, to determine what products they can use and how to use them safely.”

In its review of paraquat that was published in August, the APVMA concluded: “There is not a robust association between exposure to paraquat and the development of Parkinson’s disease, when used in accordance with the label directions.”

The ABC has previously revealed that the science underpinning the APVMA’s advice on paraquat’s connection to Parkinson’s was based on an unpublished paper funded by the maker of the chemical, Syngenta.

US neurologists also pushing for paraquat ban

In the US, Rochester University professors Ray Dorsey and Michael Okun are also lobbying the APVMA to ban paraquat in Australia.

In a letter to the regulator’s CEO, Scott Hansen, they warned the health risk was not limited to farmers.

“As you know, farmers who work with paraquat have a 150 per cent increased risk of developing Parkinson’s disease,” Dr Dorsey and Dr Okun wrote in October.

“These individuals have little protection from the weedkiller’s effects.”

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The professors also called on the regulator to consider the tactics of Syngenta, the company that first manufactured paraquat.

“Researchers from around the world have demonstrated that in the laboratory, paraquat produces [in animals] the symptoms (including tremor) and pathology (loss of dopamine-producing nerve cells) of Parkinson’s ... this research has been conducted by researchers from around the world for the past 25 years,” they wrote.

Syngenta maintains that paraquat does not cause Parkinson’s disease and is safe to use if the label is followed.

But Dr Dorsey and Dr Okun note that in the 1960s, the company’s own researchers “exposed mice, rats, and rabbits to paraquat, and they developed the symptoms and pathology of the disease”.

“The company ... has also sought to discredit scientists investigating paraquat and concealed its own research findings from regulators,” Dr Dorsey and Dr Okun wrote.

“These actions beg the question of what else does the company know about paraquat that we do not? Of note, the company’s home country and England, where the pesticide is manufactured, have long banned use of the toxic weedkiller.”

Dr Blacker told the ABC he doesn’t want to be seen as an activist, but as a neurologist representing medical science.

“[They’ll wonder] why did Australia take so long? Why did the United States take so long to join the rest of the world?”

The APVMA declined to comment on this story, but said in a statement it was currently consulting on the proposed regulatory decision for paraquat, adding: “We have public statements and information available and decline to comment further.”

The regulator is due to make its final regulatory decision on paraquat by February 28, 2025.

ABC, 28 October 2024

<https://abc.net.au>

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Japanese Sardines Found Along California's Coast

2024-10-24

Japanese sardines have made their way to California's coast, sometimes schooling together with native Pacific sardines.

When research scientist Gary Longo first saw the results of his genomic analysis of sardines, he thought he must have mixed up his samples.

Besides the Pacific sardines common on the West Coast, many of the fish appeared to be another species. "It was a total shock," he said. Then he compared their genetic code to other known species. "That was the 'aha moment' when we realized we were looking at a second species of sardine."

The analysis shows that of the 345 sardine samples collected during NOAA Fisheries' 2021 and 2022 Coastal Pelagic Species Surveys, all of the fish in 2021 were Pacific sardines, but those collected in 2022 were a mix of Pacific sardines and Japanese sardines.

Examination of another 825 sardines collected the following year found the same result: many were Japanese sardines. Known only from the west side of the North Pacific Ocean near Asia, the Japanese species had not been documented on the West Coast before.

The scientists from NOAA Fisheries and other institutions reported the surprise appearance today in the journal *Molecular Ecology*. Both species look so similar that only genetic examination can tell them apart. The scientists took advantage of recent advances in genomic sequencing to examine data from millions of genetic markers and constructed full mitochondrial genomes for sardine to verify the identification.

In 2022 and 2023, Japanese sardines were found from Washington State to southern California and were sometimes schooling together with Pacific sardines. The Japanese sardines were 1 to 3 years old, typical adult age classes for sardines.

Curious if the Japanese sardines had been missed in previous surveys, the researchers took advantage of the genetic resources archive at the Southwest Fisheries Science Center. They sequenced tissue samples from past coastal pelagic species surveys. Analyses of sardines collected from 2013–2021 found no sign of Japanese sardines, suggesting that their cross-ocean travel is a more recent development.

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Pacific sardines are currently at low abundance throughout the California Current. This may have made the detection of the Japanese sardine more likely.

More Questions than Answers

The 2022 NOAA Fisheries survey first collected the Japanese species, suggesting that they arrived on the West Coast about that time. The following year's survey in 2023 found more, but it's not clear how long the Japanese species continued to move east across the ocean. Scientists are currently examining samples from this year's survey.

Sardines are key forage fish across the globe, with two species occurring in the North Pacific. Earlier genetic studies hypothesized that Pacific and Japanese sardines diverged about 200,000 to 300,000 years ago. Glacial periods turned much of the North Pacific very cold, separating the two populations.

Though there have been many examples of western Pacific species arriving on the West Coast, these have mostly been associated with floating debris carried by the North Pacific Current. In this case, the authors suggest that marine heatwaves that warmed the North Pacific over the last decade opened a corridor of favorable habitat. The Japanese sardines may have followed the corridor across the ocean.

"Small coastal pelagic fish such as sardines are good indicators of change," Longo said. "Often they are the first ones we see responding to shifting temperatures because they have short generation times, are highly mobile, and can use a variety of habitats." The scientists suggested that the sardines may be at the "leading edge" of further changes to come.

"It leaves us with many more questions than we can possibly answer right away," said Matthew Craig, a research scientist at the Southwest Fisheries Science Center and coauthor of the new study. "A lot of fish distributions change as ocean conditions change. Now the question is whether Japanese sardines will die out over time, or will they persist in this new part of their range."

Next Steps for Sardine Analysis

Longo and Craig are now back in the laboratory, examining about 700 new samples from the 2024 Coastal Pelagics Species Survey, which just concluded. The team will sequence DNA from the fish in the coming weeks, helping trace the continuing presence of Japanese sardines in the California Current Ecosystem.

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Scientists do not know if the two sardine species can interbreed. This is a key question that would help determine how these two sardine species may interact along the West Coast. That would then inform how the presence of Japanese sardine may impact sardine management in the California Current ecosystem.

The research highlights the value of long-term monitoring. The results may change our understanding of sardine distribution and dispersal in the Pacific, and impacts of changing ocean conditions.

“This is one of those remarkable discoveries that never would have happened if scientists had not been out there, looking,” said Kristen Koch, director of the science center. “The long-term records from earlier surveys also help us understand how unusual it is.”

Technology Networks, 24 October 2024

<https://technologynetworks.com>

Researchers find a surprising link between dishwashers and chronic illnesses

2024-10-21

A recent study by researchers at the Swiss Institute of Allergy and Asthma Research (SIAF), linked with the University of Zurich (UZH), has unveiled the harmful effects of an ingredient in commercial rinse agents on the gastrointestinal tract. This discovery has significant public health implications, as the toxic substance may initiate various chronic diseases.

Commercial dishwashers, commonly used in settings such as restaurants and barracks, wash plates, glasses, and cutlery through a two-step process. The first step involves a 60-second high-pressure cycle with hot water and detergent. The second step is another 60-second cycle where water and a rinse agent are applied.

The study found that many dishwashers lack an extra wash cycle to remove leftover rinse aid, allowing potentially toxic substances to dry on the dishes. When these dishes are reused, the dried chemical residue can easily enter the gastrointestinal tract.

The research, led by Cezmi Akdis, UZH professor of experimental allergology and immunology and director of SIAF, examined the impact of components in commercial-grade detergents and rinse agents on the gut’s epithelial barrier. This barrier, a layer of cells lining the intestinal tract, regulates what enters the body.

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Defects in this barrier are linked to conditions such as food allergies, gastritis, diabetes, obesity, liver cirrhosis, rheumatoid arthritis, multiple sclerosis, autism spectrum disorders, chronic depression, and Alzheimer’s disease.

The study utilized human intestinal organoids and intestinal cells on microchips, a cutting-edge technology that forms a three-dimensional clump of cells resembling the human intestinal epithelium. Using various biomolecular methods, the team analyzed the effects of commercial detergents and rinse aids on these cells, diluting the substances to concentrations that would be present on dry dishes (1:10,000 to 1:40,000).

The results revealed that high doses of rinse agents killed the intestinal epithelial cells, while lower doses made the barrier more permeable. This increased permeability was accompanied by the activation of several genes and cell signaling proteins that could provoke inflammatory responses. A more in-depth analysis identified alcohol ethoxylates, a component of the rinse agent, as the culprit.

The researchers warn that this effect could lead to the gradual destruction of the gut’s epithelial layer, potentially triggering numerous chronic diseases. Akdis emphasizes the need for public awareness and immediate action: “It is important to inform the public about this risk, since alcohol ethoxylates seem to be commonly used in commercial dishwashers.”

The connection between defective epithelial barriers and chronic illnesses has been explored in many studies. Akdis, who has over 20 years of research experience in this field, explains that various additives and chemicals encountered in daily life can damage these layers. “We assume that defective epithelial barriers play a role in triggering the onset of two billion chronic illnesses,” he says. This correlation is supported by the epithelial barrier hypothesis, a concept Akdis has contributed to significantly.

The findings underscore the importance of addressing the risks associated with commercial dishwashers, which are prevalent in many environments. The toxic effects of rinse agents on the gastrointestinal tract highlight the need for immediate public health interventions to mitigate the potential onset of chronic diseases.

These findings call for urgent public health measures to protect individuals from the harmful effects of these substances, particularly given their widespread use in dishwashers. The research highlights the critical role of the epithelial barrier in maintaining health and preventing chronic

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diseases, urging further exploration and mitigation of risks associated with everyday chemical exposures.

Other potential health risks associated with dishwasher use in the home

The use of automatic dishwashers in homes has become a staple for convenience, but there are potential health concerns associated with them. While they save time and water compared to handwashing, certain risks could affect both short-term and long-term health.

Chemical Exposure from Dishwasher Detergents

Dishwasher detergents often contain harsh chemicals, such as phosphates, chlorine, and artificial fragrances, which can leave residue on dishes. When ingested over time, even trace amounts of these chemicals could contribute to health problems. Some studies suggest that long-term exposure to these chemicals might lead to irritation of the digestive system or disrupt hormonal balances.

Microbial Growth in Dishwashers

Automatic dishwashers create warm, moist environments that are ideal for microbial growth. Bacteria and fungi, such as *Escherichia coli* and *Candida parapsilosis*, can thrive on the rubber seals, filters, and crevices inside dishwashers. These microorganisms can potentially contaminate clean dishes if the appliance is not regularly cleaned and maintained. If ingested, these pathogens could lead to infections, particularly in individuals with weakened immune systems.

Airborne Chemical Release

During the drying phase, dishwashers release steam that could carry volatile organic compounds (VOCs) from the detergents used. VOCs, such as formaldehyde, are known for their potential respiratory and carcinogenic effects. Prolonged exposure to VOCs from frequent dishwasher use may exacerbate respiratory conditions like asthma.

Plastic Leaching

If plastic dishes or containers are cleaned in a dishwasher at high temperatures, there is a risk that harmful chemicals, such as bisphenol A (BPA), can leach from the plastic. BPA has been linked to various health issues, including endocrine disruption, which can lead to reproductive health problems.

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Possible Allergens and Irritants

For people with chemical sensitivities or allergies, the residues left on dishes from detergents or the dishwasher's own plastic components can trigger allergic reactions. Symptoms can include skin irritation, headaches, or respiratory issues after consuming food or using dishes cleaned in the dishwasher.

While dishwashers offer many conveniences, they can expose households to chemicals and microorganisms that may pose health risks.

Literature:

Ismail Ogulur, Yagiz Pat, Tamer Aydin, Duygu Yazici, Beate Rückert, Yaqi Penq, Juno Kim, Urszula Radzikowska, Patrick Westermann, Milena Sokolowska, Raja Dhir, Mubecel Akdis, Kari Nadeau, Cezmi A. Akdis. Gut epithelial barrier damage caused by dishwasher detergents and rinse aids. *The Journal of Allergy and Clinical Immunology*.

The Brighter Side, 21 October 2024

<https://thebrighterside.com>

Chemists just broke a 100-year-old rule and say it's time to rewrite the textbooks

2024-10-31

UCLA chemists have found a big problem with a fundamental rule of organic chemistry that has been around for 100 years—it's just not true. And they say, It's time to rewrite the textbooks.

Organic molecules, those made primarily of carbon, are characterized by having specific shapes and arrangements of atoms. Molecules known as olefins have double bonds, or alkenes, between two carbon atoms. The atoms, and those attached to them, ordinarily lie in the same 3D plane. Molecules that deviate from this geometry are uncommon.

The rule in question, known as Bredt's rule in textbooks, was reported in 1924. It states that molecules cannot have a carbon-carbon double bond at the ring junction of a bridged bicyclic molecule, also known as the "bridgehead" position. The double bond on these structures would have distorted, twisted geometrical shapes that deviate from the rigid geometry of alkenes taught in textbooks.

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Olefins are useful in pharmaceutical research, but Bredt's rule has constrained the kind of synthetic molecules scientists can imagine making with them and prevented possible applications of their use in drug discovery.

A paper published by UCLA scientists in the journal *Science* has invalidated that idea. They show how to make several kinds of molecules that violate Bredt's rule, called anti-Bredt olefins, or ABOs, allowing chemists to find practical ways to make and use them in reactions.

"People aren't exploring anti-Bredt olefins because they think they can't," said corresponding author Neil Garg, the Kenneth N. Trueblood Distinguished Professor of Chemistry and Biochemistry at UCLA.

"We shouldn't have rules like this—or if we have them, they should only exist with the constant reminder that they're guidelines, not rules. It destroys creativity when we have rules that supposedly can't be overcome."

Garg's lab treated molecules called silyl (pseudo)halides with a fluoride source to induce an elimination reaction that forms ABOs. Because ABOs are highly unstable, they included another chemical that can "trap" the unstable ABO molecules and yield products that can be isolated.

The resulting reaction indicated that ABOs can be generated and trapped to give structures of practical value.

"There's a big push in the pharmaceutical industry to develop chemical reactions that give three-dimensional structures like ours because they can be used to discover new medicines," Garg said.

"What this study shows is that contrary to one hundred years of conventional wisdom, chemists can make and use anti-Bredt olefins to make value-added products."

The authors on the study include UCLA graduate students and postdoctoral scholars, Luca McDermott, Zachary Walters, Sarah French, Allison Clark, Jiaming Ding and Andrew Kelleghan, as well as Garg's longstanding collaborator and computational chemistry expert Ken Houk, a distinguished research professor at UCLA.

Phys Org, 31 October 2024

<https://phys.org>

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Spin current observations from organic semiconductor side

2024-10-30

Electrons spin even without an electric charge and this motion in condensed matter constitutes spin current, which is attracting a great deal of attention for next-generation technology such as memory devices. An Osaka Metropolitan University-led research group has been able to gain further insight into this important topic in the field of spintronics.

To investigate the characteristics of spin currents, OMU Graduate School of Science Professor Katsuchi Kanemoto's group designed a multilayer device consisting of a ferromagnetic layer and an organic semiconductor material.

By adopting a doped conducting polymer with a long spin relaxation time, the team succeeded in observing the effects of spin transport and spin current generation from the non-magnetic, organic semiconductor side.

The long spin relaxation times not only make for more efficiency in spintronics, but also enable direct observation of phenomena due to spin current generation in the organic layer side.

Moreover, the researchers were able to find that, contrary to a theory that has been generally accepted, the width of the ferromagnetic resonance measurements for the layer of the spin current supplier slightly narrowed in the device system using the organic semiconductor with a long spin relaxation time.

"The use of the organic semiconductor makes it possible to pursue physical properties from the non-magnetic layer side, for which there was no information until now," explained Professor Kanemoto.

"Our work can be expected to contribute to a deeper understanding of the properties of spin currents."

The findings were published in *Advanced Electronic Materials*.

Science Daily, 30 October 2024

<https://sciencedaily.com>

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Revolutionary Catalyst Mimics Enzymes for Simpler, More Efficient Production

2024-10-19

University of Illinois chemists developed an enzyme-inspired catalyst to streamline ether synthesis, making it more efficient and versatile. This breakthrough allows the creation of complex ethers with fewer steps and materials, holding potential for broad applications in chemistry and industry.

Inspired by enzymes, chemists at the University of Illinois Urbana-Champaign have created a catalyst that streamlines the synthesis of ethers, essential components in numerous drugs, foods, personal care products, and other consumer goods. This catalyst aligns the two chemical ingredients in optimal proximity and orientation, enabling them to react without the extra steps and quantities typically needed in conventional synthesis methods.

Led by U. of I. chemistry professor M. Christina White, the researchers published their findings in the journal *Science*.

"Ethers are very important molecules — they're in everything — and our approach really streamlines the process for making them, as well as lets us make ethers we couldn't before," said White. "We always are inspired by nature. Enzymes showed us the way we could do these reactions better, simpler, and more efficiently."

Challenges in Ether Synthesis

The ideal ingredient pairing for making an ether is an alcohol and a hydrocarbon called an alkene, but they won't react on their own if mixed together, said graduate student Sven Kaster, the first author of the study. The textbook protocol involves ripping a proton from the alcohol, which makes it reactive, but results in a mixed cocktail of products from which the desired ether must be extracted. It also requires large amounts of the ingredients to yield enough ether to be useful, which is not practical for complex, valuable components.

"We took a different approach to solving the problem," Kaster said. "We did not want to activate the alcohol, and we didn't want to have to use large quantities of the reaction partners."

The researchers developed self-assembling small-molecule catalysts containing the metal palladium that can cleave a bond between carbon and hydrogen in an alkene to make it react with alcohol. They dubbed the

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catalysts SOX. However, just making alkenes reactive wasn't enough to yield the ethers the researchers wanted.

Broad Applications and Future Research

They turned to biology for inspiration, looking at how enzymes catalyze complex reactions in nature: by placing the reaction partners close together and in the right orientation to react, White said. They produced a version of the SOX catalyst, Sven-SOX, with specific geometry and electronic properties so that the activated alkene and the alcohol would align just right to produce the desired ethers.

"It's like, if two people want to hold hands, they have to be close together. But to do it comfortably, they also have to be facing the right way," White said. "We brought together those two functions, proximity and position, and kind of built our own self-assembling 'enzyme,' but with simple components."

The Sven-SOX catalyst worked over a broad spectrum of ether-generating reactions. The researchers produced more than 130 ethers, including complex, bulky ones that have thus far been challenging to produce under other means.

"The main advantage to our approach is the generality. We can make a lot of ethers that haven't been made before, that may have new or useful functions," Kaster said. "We can make ethers with components that are very bulky and normally hard to put together. Our reaction also has very mild conditions, and because of that, we can tolerate very sensitive groups that normally, under the textbook method, would undergo reactions that we don't want. Another advantage is that we make these ethers more efficiently, using less material and fewer steps. It's a procedure a middle schooler could do."

Next, the researchers plan to explore other small-molecule catalysts that could have enzyme-like characteristics for making other classes of chemicals. They also will continue to explore ether reactions and how to optimize them.

"This really highlights the importance of basic science and the power of small molecules to perform like an enzyme," White said. "This work showed us how to think about designing such catalysts in the future and making use of the tools that enzymes use in nature. We want to incorporate that

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into future catalyst design to solve important problems in chemistry, medicine, and industry.”

Sci Tech Daily, 19 October 2024

<https://scitechdaily.com>

New method successfully recycles carbon fiber composite into reusable materials

2024-10-31

USC researchers have developed a new process to upcycle the composite materials appearing in automobile panels and light rail vehicles, addressing a current environmental challenge in the transportation and energy sectors. The study recently appeared in the *Journal of the American Chemical Society*.

“I wasn’t sure if it was possible to fully recycle composite materials,” said Travis Williams, professor of chemistry at the USC Dornsife College of Letters, Arts and Sciences. “As wonderful as these materials are for making energy-efficient vehicles, the problem with composites is we don’t have a practical route to recycle them, so the materials end up in landfills.”

The chemistry demonstrated in the study, a partnership among Williams and professors Steven Nutt of the M.C. Gill Composites Center at the USC Viterbi School of Engineering, Clay C.C. Wang of the USC Alfred E. Mann School of Pharmacy and Pharmaceutical Sciences and Berl Oakley of the University of Kansas, is a new approach that shows that composite materials can be recovered and recycled in a manner that preserves the integrity of the materials.

An everyday material

Carbon fibers are thin fibers made of carbon atoms; they’re extremely lightweight but have very high tensile strength and stiffness ideal for manufacturing. A polymer matrix is a plastic-like, rigid material (such as epoxy, polyester or vinyl resins) that acts as a binder; a polymer holds carbon fibers together and gives composite materials their shape.

A CFRP, or carbon fiber reinforced polymer, is a composite material that combines the components of carbon fibers and polymers. “The study demonstrates the first successful method to reclaim high value from both the carbon fiber and polymer matrix of CFRP materials,” Williams said.

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“If you look around the world, you’ll see carbon fiber composites everywhere,” Williams said. “They’re in my bike, my car and my neighbor’s prosthesis.”

Composite materials are one of the most prevalent materials used in large-scale manufacturing. The structural panels, as well as many other components, of automobiles and airplanes are increasingly being made using CFRPs.

“The challenge with CFRPs is that you can’t melt them or rebind them, which makes them difficult to separate and recycle at the end of their useful life,” Williams said. In fact, the only recycling method available, applied to about 1% of composite waste, is to burn off the polymer matrix.

Nutt, professor of chemical engineering at USC Viterbi, takes exception to this strategy, saying, “The matrix is an engineered material that we do not want to sacrifice.”

Sustainable method

Projections indicate that by 2030, 6,000–8,000 composite-containing commercial aircraft will reach end of life, and by 2050 retired wind turbines will generate 483,000 tons of composite waste. Williams said his lab’s upcycling method offers a sustainable solution to a growing waste problem: “Our method has the potential to create new value chains in recycling and chemical manufacturing while significantly reducing the environmental impact of composite materials.”

The upcycling method saves the carbon fibers of the CFRP, which are the strong, durable part of the material. These fibers stay in good condition, and the team showed how they can be reused in new manufacturing, keeping over 97% of their original strength. This method is the first to successfully claim value from both the matrix and carbon fiber parts of CFRPs, turning waste into useful products and reducing environmental harm.

Fungal solution

Biotechnology is crucial for recovering value from the discarded polymer matrix. The researchers also introduced a special type of a fungus called *Aspergillus nidulans* that was first engineered in the Berl Oakley lab at the University of Kansas. The USC team found that this fungus can rebuild the material from the composite matrix after the fiber recycling reaction chops the polymer into benzoic acid, which is then used as a food source for the

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fungus to produce a chemical called OTA ((2Z,4Z,6E)-octa-2,4,6-trienoic acid) using an engineered strain of this fungus.

“OTA can be used to make products with potential medical applications, like antibiotics or anti-inflammatory drugs,” said co-researcher Wang, professor at USC Mann and chair of the Department of Pharmacology and Pharmaceutical Sciences. “This discovery is important because it shows a new, more efficient way to turn what was previously considered waste material into something valuable that could be used in medicine.”

The upcycling method not only demonstrates the potential of using fungi for biocatalytic upgrading of waste materials but also highlights a novel approach to recycling composite materials by recovering both fibers and matrix components as high-value products.

“This breakthrough comes at a crucial time, as the demand for CFRPs continues to grow,” Williams said. “With projections indicating significant increases in CFRP waste in the coming decades, this concept offers a promising solution for sustainable materials management.”

Phys Org, 31 October 2024

<https://phys.org>

Paving the way for harvesting and storing solar energy efficiently

2024-10-29

As stated by the International Energy Agency (IEA), approximately 50 percent of global final energy consumption is dedicated to heating. Yet, the utilization of solar power in this sector remains relatively low compared to fossil energy sources. An inherent problem limiting the widespread usage of solar energy is the intermittency of its direct availability. A promising solution comes in the form of molecular solar energy storage systems.

Conventional thermal energy storage strategies store the energy for short periods, e.g., in the form of hot water. In contrast, molecular solar energy storage systems store solar energy in the form of chemical bonds, allowing it to be preserved for several weeks or even months. These specialized molecules -- or photoswitches -- absorb solar energy and release it later as heat, on demand. However, a key challenge for current photoswitches is the trade-off between energy storage capacity and efficient absorption of solar light, limiting the overall performance. To overcome this issue,

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research teams at Johannes Gutenberg University Mainz (JGU) and the University of Siegen present a novel approach in a collaborative study.

Decoupling the absorption and storing processes of solar energy

The novel class of photoswitches was first introduced by the group of Professor Heiko Ihmels at the University of Siegen, demonstrating exceptional energy storage potential comparable to conventional lithium-ion batteries. However, their functionality was initially limited to activation by UV light, which constitutes only a small portion of the solar spectrum. The research teams at Mainz and Siegen now introduced an indirect light harvesting method, comparable to the function of the light-harvesting complex in photosynthesis. This incorporates a second compound, a so-called sensitizer, which exhibits excellent absorption properties of visible light. “In this approach, the sensitizer absorbs light and subsequently transfers energy to the photoswitch, which cannot be directly excited under these conditions,” explained Professor Christoph Kerzig of the JGU Department of Chemistry.

This new strategy has increased solar energy storage efficiency by more than one order of magnitude, representing a major step forward for the energy conversion research community. The potential applications of these systems span from household heating solutions to large-scale energy storage, offering a promising path towards sustainable energy management.

Mechanistic studies essential for reaction discovery and optimization

The Mainz-based team of researchers led by Professor Christoph Kerzig and PhD student Till Zähringer conducted detailed spectroscopic analyses to explore the complex system, which were essential for understanding the underlying mechanism. Each reaction step was carefully examined by the paper's first author, Till Zähringer, resulting in a thorough understanding of how the system operates. “By doing so, we could not only push the light-harvesting limit substantially but also improve the conversion efficiency of light to stored chemical energy,” explained Zähringer. Under operational conditions, each absorbed photon can trigger a chemical bond formation process, which is rarely observed in photochemical reactions owing to several energy loss channels. The scientists successfully validated the system's robustness and practicality by cycling between the energy storage state and the energy release state multiple times employing solar light, highlighting its potential for real-world applications.

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The results have been published in *Angewandte Chemie*, where the work has been classified as a Hot Paper due to exceptional evaluations from scientific reviewers.

This research project received financial support from the German Research Foundation (DFG) and the German Federal Environment Foundation, providing a project grant to Christoph Kerzig and a fellowship to Till Zähringer, respectively. Further support came from the House of Young Talents and the Stiftung Nagelschneider of the University of Siegen.

Science Daily, 29 October 2024

<https://sciencedaily.com>

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[Chemical Upcycling of Expired Pharmaceuticals as a Source of Value-Added Chemicals for Organic Synthesis and Medicinal Chemistry](#)

ENVIRONMENTAL RESEARCH

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