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CHEMICAL EFFECTS

In-Plane Exposed Metal Sites in Covalent Organic Frameworks for High-Performance Lithium Sulfur Batteries

2025-10-25

Covalent organic frameworks (COFs), featuring structural tunability and high porosity, have attracted great interest and are being developed into metal-COFs (M-COFs) by introducing metal atoms to boost their electrocatalytic performance. However, current M-COFs in Li-S batteries are fully metal coordinated in-plane environments, showing less exposed metal sites due to eclipsed (AA/AA') stacking modes. Here, a bottom-up molecular design strategy is proposed to construct M-COFs with in-plane exposed metal sites by precisely incorporating pyridine N atom pairs into the COF framework. Comprehensive experimental characterizations and theoretical calculations demonstrate that the in-plane exposed active sites significantly reduce activation barriers for polysulfides conversion, thereby achieving excellent rate performance (1412 mAh g⁻¹ at 0.5 C, 842 mAh g⁻¹ at 5 C) and cycle stability (0.027% capacity fade per cycle over 2000 cycles at 1 C).

Authors: Hao Zhou, Chenghao Zhao, Mengchen Sun, Zhaoyu Chen, Yu Zhang, Naiqing Zhang

Full Source: *Advanced materials* (Deerfield Beach, Fla.) 2025 Oct 25:e10963. doi: 10.1002/adma.202510963.

Associations between emerging endocrine-disrupting chemicals and thyroid hormone homeostasis in pregnant women

2025-10-23

Epidemiological evidence on the effects of emerging endocrine-disrupting chemicals (EDCs) on thyroid function during pregnancy is limited. This study investigated associations between 17 emerging EDCs and thyroid hormone (TH) homeostasis in 764 pregnant women from the Jiashan birth cohort, examining oxidative stress as a potential mediator. Urinary concentrations of EDCs (e.g., p-phenylenediamine antioxidants, bisphenol diglycidyl ethers, and benzothiazoles/benzotriazoles), three oxidative stress biomarkers, and plasma levels of five THs were measured at 8-16 weeks of gestation. Multivariable linear regression analyses, adjusted for multiple testing, showed that higher exposure to N-(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine-quinone (6PPD-Q), bisphenol S (BPS), and 1-H-benzotriazole (1-H-BTR) was associated with

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elevated total triiodothyronine (TT3) levels, with an increase of 5% (95% CI: 0.01 to 0.08) for each compound (highest vs. lowest tertile for 6PPD-Q and BPS, middle vs. lowest tertile for 1-H-BTR). Notably, 6PPD-Q and 1-H-BTR were associated with decreased ratios of total thyroxine (TT4) to TT3 and free thyroxine (FT4) to free triiodothyronine (FT3) and increased TT3 to FT3 ratios. Similar associations were observed for BPS, 2-hydroxybenzothiazole (2-OH-BTH), bisphenol A (2,3-dihydroxypropyl) glycidyl ether (BADGE-H2O), and bisphenol a-bis(2,3-dihydroxypropyl) ether (BADGE-2H2O). Bayesian Kernel Machine Regression analyses showed the EDC mixture linked to decreased TT4/TT3 and FT4/FT3 ratios, with 6PPD-Q as the main contributor. Mediation analyses indicated that oxidative stress, measured by 8-hydroxy-2'-deoxyguanosine (8-OHdG), significantly mediated the association between higher 6PPD-Q exposure (highest vs. lowest tertile) and increased FT3 levels, with a mediation proportion of 33.31%. These findings highlight the potential health risks of emerging EDCs, warranting further research.

Authors: Zhenzhen Xie, Hui Gu, Honglei Ji, Jianya Xi, Xiuxia Song, Xia Wang, Maohua Miao, Wei Yuan, Yuxian Liu, Qizhen Wu, Zhilei Liu, Jingchuan Xue, Hong Liang

Full Source: *Environmental research* 2025 Oct 23:123190. doi: 10.1016/j.envres.2025.123190.

Prognosis of simplified metal and organic sites resembling a quasi-MOF structure for hydrogen storage: investigation and insight

2025-10-22

Hydrogen energy plays an important strategic role as a sustainable and clean energy source for the future, and the use and efficient design of hydrogen storage and transportation materials are essential. Exploration into the usage and efficient design of hydrogen energy storage and transportation materials is necessary. However, a state of confusion and uncertainty exists regarding the similar operational mechanisms and details of hydrogen storage materials. This article focuses on the study of Zr-, Co-, In-, and Cu-based gas adsorption materials represented by metal organic framework (MOF)-derived structures. In this work, the basic unit planning and configuration design of metal coordination were analyzed and compared separately; the summarized working mode and rules of organic linking agents, represented by benzene-1,4-dicarboxylic acid (BDC) and its longitudinal chain derivatives, were concluded; based on experimental references, the adsorption relationship of samples under non adiabatic conditions was processed and evaluated, and the dynamic

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evolution process of sample gas adsorption was elucidated. Through the deployment of specific functions and non-adiabatic environment orchestration, we found that both the structural design and samples met the expected actual values, and some structural samples exceeded the theoretical level of the normal UIO-66 and MOF-74 series. This work analyzes and advocates for a potential benign hydrogen adsorption scheme using a MOF morphology, provides potential adsorption materials that can improve environmental tolerance, and reveals their adsorption response laws. Ultimately and fortunately, these materials could become strong competitors in the field of hydrogen storage functional materials.

Authors: Ruiqi Lyu, Xiangya Xu, Yi Man, Yu Bai, Wei Li, Dongbing Liu
Full Source: RSC advances 2025 Oct 22;15(47):40129-40148. doi: 10.1039/d5ra06111c.

ENVIRONMENTAL RESEARCH

Impact of carbon nanotubes on pulmonary disorders attributed to occupational and environmental exposures

2025-10-23

With widespread use of carbon nanotubes (CNTs) in manufacturing, the public is increasingly exposed to these materials being released into the environment, with concerns of potential adverse effects on respiratory health. Studies have demonstrated that exposure to CNTs initiates inflammatory cascades and oxidative stress. CNT inhalation challenge in rodents often produces granulomatous inflammation and lung fibrosis. CNT exposure causes TH2 asthmatic inflammation in animal models. CNTs are implicated in disrupting the delicate balance of extracellular matrix homeostasis, contributing to fibrotic remodeling. Limited mechanistic studies exist but epidemiological data suggest a link between CNT exposure and the development of fibrotic and granulomatous lung diseases. In this review, we will discuss the impact of CNT exposure on the respiratory system and how CNT can be used in modeling lung disease.

Authors: Afzaal Nadeem Mohammad, Yesenia Moreno, Garrett Grischo, Ying Liang, Stephanie Iusim, Sally Suliman, Ting Wang, Vladimir V Kalinichenko, Kenneth S Knox, Mrinalini Kala
Full Source: Nanomedicine: nanotechnology, biology, and medicine 2025 Oct 23:102871. doi: 10.1016/j.nano.2025.102871.

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Endocrine Disrupting Phenolic Plasticizers in the Bay of Bengal Coastal Waters, India: Occurrence, Distribution and Environmental Risk Assessment

2025-10-23

Phenolic compounds are widely used as plasticizers and contribute to environmental contamination. They are considered endocrine-disrupting chemicals (EDCs) due their adverse effects on endocrine systems of organisms. In this study, six phenolics Octylphenol (OP), Nonylphenol (NP), Cumylphenol (CP), Bisphenol A (BPA), Bisphenol S (BPS), and Bisphenol F (BPF) were quantified using gas chromatography-mass spectrometry (GC-MS) to assess their distribution in seawater, sediment and fish from the Bay of Bengal, India. The total concentrations of these phenolics in seawater, sediment and fish ranged as Non-detectable (ND) - 3949 ng/L, ND - 2195 ng/g (dry weight) and 4.04 - 2609 ng/g (wet weight), respectively. NP was the most frequently detected in seawater and sediment, followed by BPA. OP was found high next to NP in fish. However, the distribution of phenolics was not uniform. BPF was measured in seawater with less frequency but not detected in sediment and fish. The hazard quotient (HQ > 1) suggests ecological risk posed by NP to algae and crustaceans. The human risk quotient (RQ_{Human}) indicates a dietary risk by NP (>1) through fish. Based on Water Quality Criteria (WQC), Environmental Quality Standard's annual average (EQS-AA) and EQS-maximum allowable concentration (MAC), Endocrine equivalent (EEQ), Environmental Risk Limits (ERL) and RQ_{Seawater}, the Gulf of Mannar (GOM) marine bioserve may face threats from the phenolic plasticizers. This is the first study on environmental burden and risks of phenolic plasticizers in the Bay of Bengal coastal region of Tamil Nadu, India, which includes the country's first marine bioserve, the GOM.

Authors: Gayathri R Chandran, Arun Elaiyaraja, Aditya Mohan Menon, Vijayakumar Bommuraj, Perumal Santhanam, Ramaswamy Babu Rajendran
Full Source: Environmental pollution (Barking, Essex: 1987) 2025 Oct 23:127307. doi: 10.1016/j.envpol.2025.127307.

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PHARMACEUTICAL/TOXICOLOGY

Long-term exposure of mice to sodium fluoride and to a mixture of endocrine disruptors causes tooth enamel and retina abnormalities associated with changes in hepatic metabolism

2025-10-14

Exposure to environmental pollutants may contribute to various health disorders, often manifesting after a prolonged period of latency. The identification of early markers is, therefore, of paramount importance. To achieve this objective, realistic models of environmental exposure were set up. Whereas most studies consider one substance or mixture with one target organ, here, in addition to the liver, two easily accessible sensitive organs, the eyes and teeth, were analyzed as good potential candidates to be original markers of environmental exposures. C57BL/6J mice were exposed to either sodium fluoride or a mixture of 15 endocrine-disrupting substances, or both, in their drinking water from the time of conception until 1 or 10 months after birth. The doses of these substances were chosen to be close to the tolerable daily intake. All mice in test groups presented lower weight gain than controls with the most significant differences observed in females 30 days after birth. Alterations in the eye retina were detected as early as 1 month of age and considerably worsened by 10 months. Dental defects were observed in all test groups at the last time point. At that age, metabolic disruptions were identified through molecular metabolomic and RNAseq analyses, while histological analyses showed no significant defects in liver. This study shows that chronic exposure to widespread toxicants resulted in hepatic metabolic disorders. However, the most evident histological and clinical signs were observed in eyes and teeth. These easily accessible stigmata may be used as early markers of low-dose exposure to environmental toxicants.

Authors: Emilie Picard, Fatima Domenica Elisa De Palma, Sophia Loiodice, Vincent Carbonnier, Seiki Achiedo, Noor Mimoun, Diluxe Mutale, Sophie Doublie, Sylvère Durand, Mélanie Bourgin, Fanny Aprahamian, Pierre Cordier, Louise Gutter, Katia Jedeon, Marie-Christine Naud, Philippe Noirez, Jean-Marc Ricort, Lotfi Slimani, Guido Kroemer, Francine Behar-Cohen, Maria Chiara Maiuri, Sylvie Babajko

Full Source: Environment international 2025 Oct 14:205:109861. doi: 10.1016/j.envint.2025.109861.

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Longitudinal characterization of clinical, developmental, and behavioral phenotypes in 101 children and adults with FOXG1 syndrome

2025-10-24

Background: FOXG1 syndrome is a severe genetic neurodevelopmental disorder characterized by intellectual and developmental disabilities (IDD), postnatal microcephaly, epilepsy, and movement disorder. With the advent of molecular therapies, establishing the natural history of FOXG1 syndrome is critical to enable clinical trial readiness. However, traditional study designs are challenging to implement for rare disorders without significant burden to participants.

Methods: The study population included 101 children and adults with (likely) pathogenic variants in or involving FOXG1 (ages 0.4 - 34.8 years). Participant medical records underwent systematic annotation and harmonization of recorded clinical phenotypes, interventions, and outcomes through use of a patient-centric real-world data (RWD) platform. Retrospective medical record data were paired with prospective administration of validated measures of development and behavior, including the Vineland-3, the Aberrant Behavior Checklist, and the Children's Sleep Habits Questionnaire. Descriptive and inferential statistics were employed to characterize longitudinal phenotypes and to explore genotype-phenotype correlations.

Results: Through systematic evaluation of 101 people with FOXG1 syndrome, we generated a robust dataset encompassing >40,000 annotated clinical terminology concepts that represent >770 cumulative patient data years. Core clinical phenotypes include IDD, gastrointestinal disorders, strabismus, epilepsy, movement disorders, and sleep problems. The FOXG1 syndrome behavioral phenotype is characterized by irritability, including aggressive behaviors, stereotypies, social withdrawal, and lethargy; in those with missense variants, features of autism spectrum disorders are also reported. Data derived from both medical records and validated measures confirm and expand upon previously described genotype-phenotype correlations, whereby truncating variants are associated with greater limitations across motor and communication domains, as well as increased frequency of core FOXG1 syndrome phenotypes. Further, individuals with truncating variants had higher scores on a composite measure of FOXG1 syndrome severity, which persists when modeled longitudinally. Employing the same composite measure, we demonstrate that FOXG1 syndrome is a static encephalopathy without evidence of neurodegeneration.

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Conclusions: By combining retrospective RWD with prospective survey administration in a large sample population, we establish the natural history of FOXG1 syndrome and highlight candidate clinical endpoints for use in clinical trials, including quantitative evaluations of communication and movement disorders.

Supplementary Information: The online version contains supplementary material available at [10.1186/s11689-025-09653-1](https://doi.org/10.1186/s11689-025-09653-1).

Authors: Elise Brimble, Pam Ventola, Elizabeth Blomenberg, Kelsey Frahlich, Kopika Kuhathaas, Christopher E Hart, Nadia Bahi-Buisson, Heather E Olson, Eric D Marsh, Gai Ayalon

Full Source: Journal of neurodevelopmental disorders 2025 Oct 24;17(1):64. doi: [10.1186/s11689-025-09653-1](https://doi.org/10.1186/s11689-025-09653-1).

Long-term exposure of mice to sodium fluoride and to a mixture of endocrine disruptors causes tooth enamel and retina abnormalities associated with changes in hepatic metabolism

2025-10-14

Exposure to environmental pollutants may contribute to various health disorders, often manifesting after a prolonged period of latency. The identification of early markers is, therefore, of paramount importance. To achieve this objective, realistic models of environmental exposure were set up. Whereas most studies consider one substance or mixture with one target organ, here, in addition to the liver, two easily accessible sensitive organs, the eyes and teeth, were analyzed as good potential candidates to be original markers of environmental exposures. C57BL/6J mice were exposed to either sodium fluoride or a mixture of 15 endocrine-disrupting substances, or both, in their drinking water from the time of conception until 1 or 10 months after birth. The doses of these substances were chosen to be close to the tolerable daily intake. All mice in test groups presented lower weight gain than controls with the most significant differences observed in females 30 days after birth. Alterations in the eye retina were detected as early as 1 month of age and considerably worsened by 10 months. Dental defects were observed in all test groups at the last time point. At that age, metabolic disruptions were identified through molecular metabolomic and RNAseq analyses, while histological analyses showed no significant defects in liver. This study shows that chronic exposure to widespread toxicants resulted in hepatic metabolic disorders. However, the most evident histological and clinical signs were

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Authors: Emilie Picard, Fatima Domenica Elisa De Palma, Sophia Liodice, Vincent Carbonnier, Seiki Achiedo, Noor Mimoun, Diluxe Mutale, Sophie Doublier, Sylvère Durand, Mélanie Bourgin, Fanny Aprahamian, Pierre Cordier, Louise Gutter, Katia Jedeon, Marie-Christine Naud, Philippe Noirez, Jean-Marc Ricort, Lotfi Slimani, Guido Kroemer, Francine Behar-Cohen, Maria Chiara Maiuri, Sylvie Babajko

Full Source: Environment international 2025 Oct 14:205:109861. doi: [10.1016/j.envint.2025.109861](https://doi.org/10.1016/j.envint.2025.109861).

OCCUPATIONAL

Adaptive resistance and defense evolution in microplastics-mediated biological exposure interfaces in municipal wastewater treatment systems

2025-10-16

enhancement QS activation resistance/defense evolution. The results confirm that three MP (PET, PE, and PP)-mediated biological exposures induce the overexpression of genes encoding extracellular polymeric substances (EPS), stabilize microbial aggregates (proteins/enzymes), and promote BXI formation while reducing catalase/superoxide dismutase inhibition. MP exposure correlated with altered microbial communities, enriched stress resistance genera (*Acinetobacter*, *Nitrospira*, and *Hyphomicrobium*), and resulted in the formation of robust co-occurrence networks (73.53-90.67 % positive correlations). Enhanced QS signaling (AI-2, DSF, and c-di-GMP) upregulated autoinducer/transporter genes, accelerating EPS synthesis and energy metabolism. MP-mediated BXI strengthens microbial resilience and nitrogen/sulfur cycle equilibrium via organic carbon degradation, nitrification-denitrification enhancement, and sulfite/thiosulfate oxidation, whereas protein-enzyme synergy improves pollutant resilience. Through signal compensation and pathway adaptation, microbial communities stabilize BXI under MP stress. These findings provide novel insights into the in situ control of MP-driven pollutant migration in MWTs.

Authors: Hongyu Tian, Jianwei Liu, Yunping Han, Shouliang Yi

Full Source: Journal of hazardous materials 2025 Oct 16:499:140105. doi: [10.1016/j.jhazmat.2025.140105](https://doi.org/10.1016/j.jhazmat.2025.140105).

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Space radiation and risk for ocular surface malignancies: Exposure risk, current mitigation strategies, and management considerations for a mission to Mars

2025-11

Ocular surface tumors, originating from either the conjunctiva or the cornea, primarily fall into three categories of malignant or premalignant neoplasms: ocular surface squamous neoplasia (OSSN), ocular surface melanocytic tumors, and conjunctival lymphoid tumors. These neoplasms can originate from either the conjunctiva or the cornea. Exposure to space radiation, particularly galactic cosmic rays, and solar particle events, poses a significant threat to astronaut health, including the development of ocular malignancies. As such, the objective of this study was to describe the exposure risk for ocular surface malignancies, current mitigation strategies, and management considerations for a mission to Mars. The current mitigation strategies for space radiation include physical and structural shielding along with dietary interventions. Additionally, management of ocular health during a Mars mission can include holoportation, AI-powered diagnostics, newest in-space surgical technology, optical coherence tomography (OCT), and more. Conclusively, further research and collaboration amongst space and healthcare professionals is necessary to ensure the safety and well-being of astronauts during future space exploration endeavors.

Authors: Raghuram V Reddy, Joshua Ong, Ryung Lee, Ritu Sampige, Ethan Waisberg, C Robert Gibson, John Berdahl, Thomas H Mader

Full Source: Life sciences in space research 2025 Nov:47:69-76. doi: 10.1016/j.lssr.2025.06.002.