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CHEMICAL EFFECTS

Organic Mixed Ionic-Electronic Conductors for Organic Electrochemical Transistors: Sidechain Structure Influences Ion Uptake and Functional Performance

2025-09-28

Organic mixed ionic-electronic conductors (OMIECs) are an emerging class of polymeric materials with opportunities for applications in bioelectronics, neuromorphic computing, and various sensing technologies owing to their mixed conduction characteristics. The performance and long-term operational stability of OMIECs, particularly in aqueous environments, can be influenced by the dynamic interactions between polymer functionalities and electrolyte species. This mini review highlights the necessity of integrating advanced operando characterization techniques and computational modeling to successfully investigate structure-property relationships. Then, recent progress in understanding how sidechain design dictates ion transport, hydration, swelling behavior, and mixed conduction properties is summarized. Furthermore, the significant impacts of electrolyte composition on doping mechanisms, structural stability, and device performance are explored; and the persistent challenges associated with extensively studied ethylene glycol sidechain designs and emerging hybrid sidechain strategies that incorporate ionic moieties are examined. Recognizing the current limitations in understanding these complex systems, particularly regarding long-term stability, this outlook focuses on elucidating fundamental structure-property relationships and degradation mechanisms. This understanding is crucial for the rational design and future development of robust and high-performance OMIEC materials for organic electrochemical transistor applications.

Authors: Siyu Qin, Zeyuan Sun, Haoxuan Li, Charleen Rahman, Thomas E Gartner 3rd, Elsa Reichmanis

Full Source: Chemphyschem: a European journal of chemical physics and physical chemistry 2025 Sep 28:e202500403. doi: 10.1002/cphc.202500403.

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Determining the impact of organic chemicals and nutrients on river ecological quality: a case study from Donegal, Ireland

2025-09-26

A benthic macroinvertebrate indicator known as Q-value shows that the ecological quality of rivers in Donegal, Ireland has declined since biological monitoring began in 2004. Previous studies suggested that the insecticide cypermethrin may be a driving factor. Cypermethrin and three other organic chemicals (MCPA, PFOA and PFOS) have been frequently detected in rivers in Donegal since hazardous chemical monitoring started in 2020. Available monitoring data on those organic chemicals and nutrients, from 15 river sites in Donegal between 2020 and 2024, were analysed to estimate their relative impact on river ecological quality, using Q-values as surrogate of ecological quality. Around 10-30% of cypermethrin, MCPA and phosphate levels were above relevant environmental standards, while PFOA, PFOS and nitrate levels were below. Bivariate analyses showed negative relationships of Q-value with cypermethrin, PFOS and nutrients but not with MCPA or PFOA. Multivariate models confirmed that cypermethrin may be an important driver of ecological decline in Donegal rivers, explaining around 20% of the Q-value trends (partial R squared, pR2: 0.2009). Q-value trends were also explained by PFOS (pR2: 0.2907), nitrate (pR2: 0.1834) and phosphate (pR2: 0.1073). Our results are based on approximately 1,500 datapoints from 15 (4%) river sampling sites in Donegal. However, they suggest the need to: 1) better align biological and chemical monitoring programmes; 2) assess the ecological impact of chemicals even at relatively low concentrations, and 3) further reduce surface water pollution from nutrients and PFAS. Future studies are recommended using larger datasets from Ireland or other countries with similar monitoring programmes.

Authors: Javier Vila, Katrina A Macintosh

Full Source: Environmental pollution (Barking, Essex : 1987) 2025 Sep 26:127178. doi: 10.1016/j.envpol.2025.127178.

Prospective study of oil spill cleanup-related exposure to volatile organic compounds and glycemic dysregulation

2025-09-26

Background: Exposures to volatile organic compounds could influence glycemic regulation. This study examines hemoglobin A1c (HbA1c) in a cohort of oil spill cleanup workers up to 6 years post-exposure in relation to benzene, toluene, ethylbenzene, and xylenes (BTEX) exposures,

individually and as a mixture, as well as a separate estimation of the aggregate sum of BTEX (total BTEX).
Methods: Data for this analysis are from the Gulf Long-term Follow-up (GuLF) Study– a prospective cohort of workers involved in the 2010 Deepwater Horizon oil spill cleanup. HbA1c and medication information were obtained at Home Visit and Clinical Exam phases 1–3 years and up to 6 years post-exposure, respectively. Cumulative inhalation exposure to the individual BTEX chemicals and to total BTEX were estimated using a job-exposure matrix linking air measurements to detailed individual worker cleanup work histories. We used Tobit regression models to examine associations between exposure to the chemicals and latent, untreated HbA1c, accounting for medication-reduced HbA1c. We used quantile g-computation to examine exposure to the mixture of BTEX chemicals and HbA1c.
Results: In results examining Home Visit HbA1c we observed no discernable patterns but found suggestive evidence of an association with total BTEX. In results for Clinical Exam HbA1c, we did not observe monotonic patterns, but rather an inverted-U pattern with elevations in Q2 or Q3 or no clear pattern. Similarly, in results for final HbA1c adjusting for initial HbA1c, total BTEX difference estimates showed an inverted-U pattern in point estimates across Q2 (0.24 95%CI (0.14, 0.34)), Q3 (0.13 95%CI (0.03, 0.24)), and Q4 (0.00 95% CI (-0.11, 0.10)), compared to Q1.
Conclusion: Exposures to the moderate levels of the BTEX chemicals observed in this study population, individually and as an aggregate, may be associated with elevated HbA1c up to 6 years after exposure, with an inverted-U pattern.
Supplementary Information: The online version contains supplementary material available at 10.1186/s12940-025-01211-5.
Authors: Hanna V Jardel, Alex P Keil, Chantel L Martin, David B Richardson, Mark R Stenzel, Patricia A Stewart, Kate E Christenbury, Dale P Sandler, Lawrence S Engel
Full Source: Environmental health: a global access science source 2025 Sep 26;24(1):67. doi: 10.1186/s12940-025-01211-5.

ENVIRONMENTAL RESEARCH

Linking Pollution and Viral Risk: Detection of Dioxins and Coronaviruses in Cats and Dogs

2025-09-19
Viral and chemical analyses were performed on 80 dead cats and 51 dead dogs from the Campania Region (Southern Italy), with the aim of

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evaluating in vivo the potential correlation between coronavirus (CoV) infections and levels of environmental pollutants such as dioxins and PCSs (PCDD/F, DL-PCB and NDL-PCB). The overall viral prevalence was 16.3% in cats and 23.5% in dogs. Both feline coronavirus (FCoV) and canine coronavirus (CCoV) were identified, with variable detection rates in all the other organs investigated, supporting studies that provide evidence of systemic viral spread. The highest prevalence of coronaviruses (CoVs) was observed in Naples (19.2% for FCoV; 30.7% for CCoV) and Caserta (11.1% for FCoV; 50.0% for CCoV), areas that include municipalities with the highest Municipality Index of Environmental Pressure (MIEP) scores. Chemical analyses showed that DL-PCBs were present at more elevated concentrations in CoV-infected dogs and cats than in non-infected animals, whereas ∑NDL-PCB and ∑PCDD/F were detected in greater amounts in non-infected subjects. Among PCDDs, the congener 2,3,7,8-TCDD displayed different distribution patterns between infected and non-infected animals. In cats, 70.0% of FCoV-positive individuals had 2,3,7,8-TCDD levels above the limit of quantification (LOQ), compared with 38.0% of FCoV-negative cats. In dogs, 78.0% of CCoV-infected animals exceeded the LOQ, compared with 20.0% of non-infected ones; this difference was statistically significant. The results of the study suggest that elevated levels of 2,3,7,8-TCDD may be associated with CCoV infection and replication in dogs, suggesting a possible relationship between environmental pollution and susceptibility to coronavirus infections.
Authors: Francesco Serra, Silvia Canzanella, Sergio Brandi, Gerardo Picazio, Anna Maria Pugliese, Luca Del Sorbo, Gianluca Miletti, Enza Ragosta, Emanuela Sannino, Filomena Fiorito, Mauro Esposito, Esterina De Carlo, Giovanna Fusco, Maria Grazia Amoroso
Full Source: Viruses 2025 Sep 19;17(9):1271. doi: 10.3390/v17091271.

The role of environmental impact assessments in hospital care: Healthcare professionals' views on research and implementation priorities

2025-09-26
Background: The crossing of planetary boundaries, such as climate change and biosphere integrity, threatens human health, while healthcare systems paradoxically contribute substantially to these environmental challenges. Although research on the environmental impact of care activities and pathways is expanding, it remains unclear how this information is used in clinical practice. This study explores healthcare professionals' views on the environmental impact of hospital care, the role of environmental impact

data and research and implementation priorities to support sustainability in clinical practice.
Methods: Semi-structured focus groups and interviews were conducted between April and July 2024 with 31 Dutch healthcare professionals working across 12 medical (hospital) specialities with the highest care volumes and expenditures. Participants were selected on the basis of their involvement or interest in green healthcare initiatives. Focus groups and interviews were transcribed verbatim and analysed using reflexive thematic analysis.
Results: Participants have a general sense of environmentally impactful care activities, including surgical procedures, medication and outpatient visits. However, they reported a lack of quantitative environmental impact data at the clinical level, limiting their ability to make informed, sustainable choices. While participants recognized multiple uses for environmental impact data and supported integrating sustainability considerations into healthcare decision-making, they emphasized the need to balance these factors with other priorities, such as clinical effectiveness, patient safety and costs. Several research gaps were identified, including the need for comparative pathway analyses and standardized metrics. Additionally, implementation priorities, such as focusing on high-volume care, leveraging healthcare co-benefits and driving systemic changes to overcome barriers in the sustainability transition, were defined.
Conclusions: Healthcare professionals lack the quantitative data needed for sustainable healthcare decision-making. Targeted research and implementation efforts should focus on high-impact, modifiable care. These findings may support better alignment between environmental research and clinical priorities, thereby informing evidence-based sustainability efforts in hospital care.
Authors: L H J A Kouwenberg, A M Wijnhoven, E S Cohen, W J K Hehenkamp, N H Sperna Weiland, D S Kringos
Full Source: Health research policy and systems 2025 Sep 26;23(1):116. doi: 10.1186/s12961-025-01386-w.

Microplastics as Vectors for Environmental Contaminants in the Food Chain: Assessing the Combined Toxicological Effects and Bioavailability

2025-09-26
The global proliferation of microplastics (MPs) and nanoplastics (NPs) has raised concerns not only for their persistence in ecosystems but also for their role as transport agents of environmental contaminants through food chains. This review provides a comprehensive analysis of the

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mechanisms driving the sorption and desorption of diverse pollutants-including hydrophobic organics, metals, additives, and microbial agents-onto plastic particles, emphasizing how polymer composition, particle size, environmental aging, and eco-corona formation influence these interactions. Particular attention is paid to the transfer of MPs/NPs across trophic levels and their documented presence in various food items consumed by humans. The paper evaluates how ingestion may lead to desorption of contaminants in gastrointestinal environments, with in vitro studies demonstrating variable bioaccessibility depending on physicochemical and digestive conditions. Furthermore, the review synthesizes findings on cellular and systemic toxicity, highlighting how exposure to MPs/NPs-alone or in combination with other contaminants-can disrupt oxidative balance, immune responses, metabolic regulation, and reproductive health. Notably, combined exposures often result in synergistic or antagonistic effects, contingent on concentration, particle properties, and biological context. The potential for translocation of smaller particles and their associated chemicals across epithelial barriers introduces an additional vector of concern for internal exposure. Methodological variability in contamination assessment, limited real-world exposure data, and unresolved questions regarding long-term health consequences underscore the need for standardization and further investigation. This review aims to inform future risk assessments by integrating current knowledge of contaminant transport, bioavailability, and co-toxicological effects related to MPs/NPs in environmental and food systems.
Authors: Jia Du, Linlin Qiu, Qingwei Zhou, Meiqing Jin, Weihong Wu
Full Source: Toxicology letters 2025 Sep 26:111734. doi: 10.1016/j.toxlet.2025.111734.

PHARMACEUTICAL/TOXICOLOGY

Current knowledge about per- and polyfluoroalkyl substances (PFAS) in the atmosphere: Fate, analytical methods and research priorities

2025-09-26
Per- and polyfluoroalkyl substances (PFAS) are increasingly recognised as ubiquitous atmospheric contaminants. The atmosphere, in turn, is an important compartment for distributing these compounds throughout the environment, allowing human exposure through inhalation and/or dermal contact. This study provides a comprehensive overview of the

current knowledge on PFAS, covering: (i) a compilation of information on emission sources - primary sources (production, manufacturing, use of AFFF, waste handling, marine spraying) and secondary sources (oxidative degradation of neutral PFAS); (ii) proposed classifications of the volatility of these substances based on vapor pressure by the U.S. Environmental Protection ECHA - European Chemicals Agency (2025); (iii) atmospheric processes that govern gas-particle partitioning, long-range transport, and deposition; (iv) an assessment of current and emerging sampling and analytical techniques, including OTM 45/50 methods; and (v) the identification of priority knowledge gaps. Among the main existing gaps, the validation of improved monitoring strategies and inhalation toxicity studies for neutral precursors could significantly contribute to a robust risk assessment and support regulatory efforts within the evolving global agenda for the phase-out of PFAS.

Authors: Hellen Gonçalves Vieira, Maria Cristina Canela, Roberta Cerasi Urban, Benigno Sanchez Cabrero

Full Source: Chemosphere 2025 Sep 26:389:144703. doi: 10.1016/j.chemosphere.2025.144703.

Comparative Analysis of Physical and Polymer Characteristics of Microplastics Detected in Human Colorectal Cancer Samples From the United States and Malaysia

2025-09-28

Background and aims: Previous studies have detected microplastics in bowel tissues, but have been limited by small sample sizes. Our study expanded the data collection from two countries at different time points (United States from 1993 to 1999 and Malaysia from 2023 to 2024) with the aim of comparing the physical and polymer characteristics of microplastics found in colorectal cancer samples.

Materials and methods: Microplastics were extracted from the tissues using a chemical digestion method of 10% potassium hydroxide, and examined under a stereomicroscope. Further surface morphology and polymeric composition were analyzed with a scanning electron microscope and micro-Fourier transform infrared spectroscopy.

Results: Microplastics were detected in all 50 samples (25 from the United States and 25 from Malaysia), with a higher abundance found in the Malaysian samples (32.2 ± 48.14 particles/g) compared to the American samples (25.00 ± 40.57 particles/g). Both population samples exhibited similar shapes, with fibers being the most abundant. American samples have longer microplastics (Category II = 501-1000 µm) than the

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Malaysian samples (Category I = < 500 µm). Both population samples exhibited surface roughness on their microplastics and similar polymer types including polyethylene (PE), polypropylene (PP), polyamide (PA) and polycarbonate (PC). Acrylonitrile butadiene styrene (ABS) was only observed in the American samples.

Conclusion: Microplastics are detected in colorectal cancer samples of both populations collected from two different time points but with similar and also distinct physical and polymer characteristics.

Authors: Nur Sakinah Roslan, Yeong Yeh Lee, Sabiqah Tuan Anuar, Ku Mohd Kalkausar Ku Yusof, Teresa Brentnall, Lisa Ann Lai, Ahmad Ammarluddin Mohd Ali, Yusof Shuaib Ibrahim

Full Source: Journal of gastroenterology and hepatology 2025 Sep 28. doi: 10.1111/jgh.70075.

OCCUPATIONAL

Effects of lithium chloride on queen egg-laying performance and worker honey bee behavior

2025-09-27

Background: Lithium chloride (LiCl) has recently emerged as a potential treatment for Varroa in honey bee colonies, yet its effects on bee behavior remain poorly understood. This study investigates, for the first time, the impact of oral exposure to chronic 50 mM LiCl-administered via candy over 7-10 days-on three key behavioral traits: queen oviposition, worker brood care, and worker aggression. Laboratory assays were conducted using caged bees with ad libitum access to LiCl-enriched or control candy.

Results: Egg-laying rates did not differ significantly between LiCl-treated and control groups. Worker bees exposed to LiCl showed a significant increase in mite mortality. Brood care behavior, assessed using a 4-day-old queen larva, was unaffected in terms of nursing frequency and duration. However, LiCl-treated workers exhibited a significant reduction in aggressive behaviors compared to controls.

Conclusions: LiCl did not adversely influence queen egg laying or workers' nursing behavior, reinforcing previous findings suggesting negligible long-term risks to essential colony maintenance activities such as queen reproductive performance and nursing behavior. The reduced aggression observation is consistent with reports from other species, suggesting a conserved modulatory role of Li on aggression across the animal kingdom. From an applied perspective, these results imply that LiCl can be used as Varroa control without compromise on colony reproduction and brood care. Furthermore, LiCl could potentially facilitate the management of

aggressive colonies, thereby reducing stress for both the bees and their handlers. © 2025 The Author(s). Pest Management Science published by John Wiley & Sons Ltd on behalf of Society of Chemical Industry.
Authors: Sevin Sedat, Jakob Avi Shimshoni, Afik Ohad, Zarhin Shlomo, Hagai Yehoshua Shpigler
Full Source: Pest management science 2025 Sep 27. doi: 10.1002/ps.70253.

Work-related asthma symptoms and lung function among workers in the Norwegian salmon processing industry: a cross-sectional study

2025-09-27
Objectives: Exposure to bioaerosols from salmon processing is associated with occupational asthma. The prevalence of work-related asthma symptoms in fish processing workers has earlier been reported to be 12%-24%, but small sample sizes and heterogeneity in exposure across studies make generalisability to todays' salmon processing industry questionable. Studies comparing filleting workers and slaughtering workers have shown conflicting results.
Methods: Questionnaire and spirometry data from workers in nine different salmon processing plants were gathered during 2021-2023. Exposure to salmon bioaerosols was defined by work tasks and total time working with salmon. Asthma symptoms and lung function were compared between exposure groups using logistic regression and adjusting for relevant confounding variables.
Results: Of the 867 workers regularly or variably exposed to salmon bioaerosols, 170 (20%) had work-related asthma symptoms. Exposure was associated with symptoms, but not with lung function. Of the 440 exposed workers with spirometry data, 9.8% had expiratory airflow limitation, and all mean lung function measures were below the reference values. The prevalence of work-related asthma symptoms was slightly higher among gutting workers than filleting workers (OR 1.7, 95% CI 1.1 to 2.8).
Conclusions: The prevalence of work-related asthma symptoms is high in salmon processing, probably due to bioaerosol exposure. Salmon processing workers had more expiratory airflow limitation and lower lung function compared with the reference values. Although gutting workers had slightly higher risk for work-related asthma symptoms than filleting workers, all exposed workers seem to be at risk and preventive measures should be taken in all areas where bioaerosols are present.
Authors: Carl Fredrik Fagernæs, Hans Thore Smedbold, Pål Richard Romundstad, Marte Renate Thomassen, Anje Christina Höper, Gro Tjalvin,

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Anna Beathe Overn Nordhammer, Hilde Brun Lauritzen, Erlend Hassel, Kaja Irgens-Hansen, Berit Elisabeth Bang, Sindre Rabben Svedahl
Full Source: Occupational and environmental medicine 2025 Sep 27:oemed-2025-110208. doi: 10.1136/oemed-2025-110208.