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CHEMICAL EFFECTS

Bifunctional SERS-Fenton micro-nano platform: Integrating ultrasensitive sensing with advanced oxidation for the detection and degradation of organic pollutants in water

2025-10-30

Organic pollutants in aquatic environments pose a threat to ecosystems and human health, a challenge that requires urgent resolution. This urgent threat highlights the need for the development of efficient technologies for pollutant detection and degradation in environmental protection. This study presents the successful fabrication of a composite nanomaterial consisting of Ag nanoparticle-decorated NiFe2O4 nanoflowers through a combined strategy of chemical reduction, hydrothermal heat followed by calcination, and physical mixing. The resulting Ag@NiFe2O4 composite exhibits a large specific surface area, and its unique flower-like hierarchical structure provides abundant adsorption sites, creating favorable conditions for pollutant enrichment detection and catalytic degradation. Notably, this material demonstrates dual functionality. It enables ultrasensitive detection of rhodamine 6G (R6G) at a minimum detectable concentration of 10-8 mol/L due to its surface-enhanced Raman scattering (SERS) effect. Moreover, it exhibits excellent photo-Fenton degradation performance, achieving 93.4 % degradation efficiency for organic pollutants within 70 min with H2O2 assistance. The charge transfer (CT) mechanism and localized surface plasmon resonance (LSPR) between the Ag@NiFe2O4 composite SERS substrate and R6G were revealed through synergistic experimental analysis and density functional theory (DFT) and finite difference time domain (FDTD) calculations, with these synergistic effects significantly enhancing SERS signal response. Simultaneously, the photo-Fenton degradation mechanism in the system was systematically elucidated. In this study, a bifunctional nanomaterial that integrates pollutant detection and degradation capabilities was innovatively developed, offering a novel technical strategy to simultaneously address the "detection-degradation" challenge in aquatic environment remediation.

Authors: Jiacheng Ding, Yandong Che, Xu Wang, Lingru Kong, Tõnu Pullerits, Peng Song, Yanqiu Yang

Full Source: Biosensors & bioelectronics 2025 Oct 30:293:118165. doi: 10.1016/j.bios.2025.118165.

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Ammonium is associated with enhanced haloacetamide formation, cytotoxicity, and aryl hydrocarbon receptor activation during sulfate radical-based oxidation of acetaminophen

2025-10-28

Acetaminophen (APAP), a widely used pharmaceutical, is frequently detected in surface waters and is a known precursor to toxic nitrogenous disinfection byproducts such as haloacetamides (HAMs). This study evaluated the performance of a sulfate radical-based advanced oxidation process (SR-AOP), employing Fe3O4@GO and peroxydisulfate (S2O82-), for APAP removal under real river water conditions across dry and wet seasons, characterized by seasonal ammonium (NH4+) variation. While APAP removal in deionized water reached 41.6 % at 15 min and 90.8 % at 4 h, the corresponding values in dry-season river water were reduced to 1.9 % and 82.9 %, respectively, indicating strong matrix interference during short reaction times. To assess potential health risks, cytotoxicity and cell proliferation were assessed using human foreskin fibroblast (HF) cells at consistent APAP concentrations. Experiments were conducted using river water samples from different seasons. Cell viability was lowest after SR-AOP, followed by SR-AOP plus chlorination, and chlorination alone. Aryl hydrocarbon receptor (AhR) activity in HepG2 cells, a key indicator of biological response to environmental pollutants, also increased ($p < 0.001$) after treatment, indicating the formation of biologically active byproducts. The treatment sequence influenced toxicity: SR-AOP plus chlorination and SR-AOP alone exhibited the greatest effects, followed by chlorination alone and then APAP contamination. Z-score analysis revealed that elevated NH4+ concentrations (up to 10.4 mg/L) were associated with enhanced TCAM formation and biological responses, particularly under SR-AOP-based treatments. These findings underscore the importance of combining chemical and biological evaluations, providing sufficient reaction time, and controlling NH4+ levels to minimize harmful byproduct formation in AOP-based water reuse.

Authors: Shih-Wen Peng, Yi-Ling Huang, Yu-Jih Su, Wei-Hsiang Chen

Full Source: Water research 2025 Oct 28;289(Pt A):124869. doi: 10.1016/j.watres.2025.124869.

Deep neural networks reveal organic pollutants' dominance in global inflammatory bowel disease

2026-02

Inflammatory bowel disease (IBD) is increasing globally, with risk factors still poorly understood and influenced by both genetic and environmental factors. The role of atmospheric pollutants, particularly precursor organic pollutants contributing to < 2.5 μm size particulate matter (PM2.5), remains unclear. In this multi-decadal global study, we investigated their contribution to IBD prevalence using data from the Global Burden of Disease (GBD, 1990-2019), NASA's MERRA-2, and AERONET datasets. A graph neural network (GNN) modeled spatio-temporal dependencies and incorporated immune dysfunction and socio-economic disparities. The dataset was split into 75 % training and 25 % testing, achieving mean squared errors of 4.3 % and 4.6 % respectively, with strong predictive validity (R2 = 0.87). A 10 % global increase in organics was associated with a rise in odds ratio (OR) by 0.21 (95 % CI: 0.12-0.29, p< 0.001), compared to a smaller OR increase of 0.04 (95 % CI: 0.01-0.09, p< 0.001) for PM2.5. Regional disparities were evident, with Sub-Saharan Africa exhibiting higher odds ratios (OR = 1.25; 95 % CI: 1.09-1.43, p< 0.01) than North America (OR = 1.08; 95 % CI: 1.03-1.24, p< 0.05) at an organic burden of 5 μg/m^3. However, this trend reversed at higher exposure (25 μg/m^3), where the OR for North America approaches 2, while Sub-Saharan Africa plateaued near 1.5. Notably, particles under 100 nm posed the greatest risk. Concluding, organic pollutants play a disproportionate and size-dependent role in IBD prevalence, with significant regional variability. This underscores the need to consider organics as a distinct environmental risk factor in IBD epidemiology.

Authors: Iman Waheed Khan, Muhammad Mueed Khan, Anthony Donato

Full Source: Journal of environmental sciences (China) 2026 Feb:160:548-558. doi: 10.1016/j.jes.2025.04.058.

ENVIRONMENTAL RESEARCH

Coffee grounds-derived core-shell aerogels: Preparation and application for diesel pollutant degradation in water

2026-02

The effective and environmentally friendly management of oily wastewater, alongside the beneficial conversion of waste biomass, holds paramount importance for environmental conservation, public health, and sustainable societal progress. In this research, an innovative biomass

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core-shell bioreactor (CGC@SiO2 aerogel) with selective adsorption and degradation properties was developed. The reactor's core is composed of coffee cellulose aerogel, offering a porous framework conducive to microbial colonization while safeguarding microorganisms from adverse external factors. The shell integrates hydrophobic silica enriched with polydimethylsiloxane, which alters the material's hydrophilic properties, enabling it to remain afloat on water for up to 100 days. This superhydrophobic layer maintained a contact angle of 150° even after ten consecutive rubbings. Experimental results indicate that the material performs exceptionally well in oil-water separation, as demonstrated by its success in 9 consecutive oil-water separations. It achieved 99 % selective adsorption, 91 % removal, and 46.2 % degradation of a 3 wt.% diesel solution under conditions of 37 °C, 120 r/min, and pH = 7. Additionally, tests assessing environmental tolerance revealed the material's robust adaptability and stability across varying pH levels and temperatures. Compared to traditional hydrophobic and lipophilic materials or free-floating microorganisms, CGC@SiO2 aerogel not only efficiently captures oil pollutants but also degrades them into non-hazardous substances. Combining biodegradation with selective adsorption has shown to be an effective approach for treating oily wastewater, offering significant practical application potential. The low-carbon production of CGC@SiO2 aerogel aligns with circular economy principles, underscoring its role in sustainable development.

Authors: Lihua Chen, Bin Zhang, Yang Jin, Yanyu He, Yuhan Zhang, Wenyu Zheng, Shaopeng Chen

Full Source: Journal of environmental sciences (China) 2026 Feb:160:264-273. doi: 10.1016/j.jes.2025.04.004.

Unraveling the threshold and interaction effects of environmental variables on cadmium contamination in rice grains

2026-02

Understanding Cd contamination in the soil-rice ecosystem and the underlying its threshold and interaction effects is crucial for controlling Cd pollution and ensuring food safety. Although the quantitative relationships between Cd and environmental variables have been extensively studied, the threshold and interaction effects of multi-source environmental variables remain largely unexplored. This study employs a combination of random forest analysis and a human health risk model to investigate the effects of variables on Cd levels in rice grains, with the goal of quantifying their contributions and elucidating their relationships.

The results indicated that the 15 selected variables collectively explained 47.36 % of the variation in Cd content, with the top three variables being soil pH, distance from industrial park, and soil Zn. The majority of variables exhibited threshold effects on Cd levels in rice grains. By visualizing the interaction between Soil pH, distance from industrial park, and soil Zn with Cd levels in rice, we demonstrate the threshold effects of them on Cd level in rice grains, thereby providing further insight into the variation observed. Furthermore, oral intake of rice has been identified as the primary route of human exposure, significantly contributing to overall exposure pathways. Understanding these interactions is crucial for gaining insights into the underlying processes driving Cd pollution and fostering sustainable development within the industry. Our findings underscore the crucial need to consider multiple environmental variables and their interactions when managing heavy metals (HMs) contamination and mitigating health risks.

Authors: Yang Zeng, Chen Shen, Bolun Zhang, Jie Ren, Zhanbin Huang, Hong Hou

Full Source: Journal of environmental sciences (China) 2026 Feb:160:450-460. doi: 10.1016/j.jes.2025.04.073.

PHARMACEUTICAL/TOXICOLOGY

A pilot study of nivolumab in combination with neoadjuvant and post-surgical chemotherapy in newly diagnosed ovarian cancer

2025-10-31

Objective: To evaluate whether the addition of nivolumab to standard neoadjuvant chemotherapy (NACT) in previously untreated advanced-stage epithelial ovarian cancer (EOC) is safe and feasible.

Methods: In this single-institution pilot study (NCT03245892), patients with advanced EOC for whom NACT was considered the most appropriate initial therapy option were treated with intravenous nivolumab 360 mg with standard carboplatin and dose-dense paclitaxel NACT every 3 weeks for 3-6 cycles. Patients then underwent interval cytoreductive surgery (ICS) followed by another 3 cycles of post-operative treatment.

Results: Safety results were consistent with the known profile of the study drugs for the 21 patients treated. Seven (33 %) patients had grade 3/4 adverse events attributed to nivolumab, with one case of grade 3 infusion reaction making that patient unevaluable. Fifteen of the 20 (75 % [95 % CI, 50.9-91.3 %]) evaluable patients had complete gross resection at ICS, and 7 of 20 (35 % [95 % CI, 15.4-59.2 %]) achieved an optimal pathologic chemotherapy response score (CRS) of 3. Median progression-free survival was 15.6 months (95 % CI, 11.6-26.4 months), with a 2-year rate of 32.5 % (95 % CI, 12.8-54.1 %). Median overall survival was 50.7 months (95 % CI, 26.5 months-not evaluable), with a 2-year rate of 85 % (95 % CI, 60.4-94.9 %).

Conclusions: The combination of nivolumab with carboplatin and paclitaxel was safe and tolerable. Most patients achieved a complete gross resection and one-third had an optimal CRS at ICS. Further studies are needed to identify patients with ovarian cancer most likely to benefit from upfront immune checkpoint blockade.

Authors: Sara Moufarrij, Claire F Friedman, Samuel Freeman, Hunter Green, Nadeem R Abu-Rustum, Vance Broach, Dennis S Chi, Seth Cohen, Ginger Gardner, Rachel N Grisham, Alexia Iasonos, Mario M Leitao Jr, Kara Long, Kay Park, William Tew, Andreas Wibmer, Qin Zhou, Carol Aghajanian, Britta Weigelt, Dmitriy Zamarin, Roisin E O'Cearbhaill

Full Source: Gynecologic oncology 2025 Oct 31:203:97-104. doi: 10.1016/j.ygyno.2025.10.020.

Real-world data and clinical experience from over 100,000 multi-cancer early detection tests

2025-10-31

Blood-based multi-cancer early detection (MCED) has the potential to simultaneously screen for multiple deadly cancers with high positive predictive value. To assess real-world performance, we evaluated the Galleri® MCED test (GRAIL, Inc.) across 111,080 individuals (median age 58 years, 55.5% males). This MCED test analyzes methylation patterns of cell-free DNA to detect presence of a cancer signal and predict the anatomical cancer signal origin (CSO) to facilitate diagnostic evaluation. Cancer signal detection rate was 0.91% (1011/111,080), consistent with clinical studies and independent modeled values. Providers reported clinical outcome for 459 of 1011 individuals with cancer signal detected MCED tests. Of these, 258 had an invasive cancer diagnosis, spanning 32 cancer types. The MCED test correctly predicted the CSO in 87% of cases with a reported cancer type, consistent with previous clinical studies. CSO enabled efficient workup in most patients, with a median 39.5 days from result receipt to cancer diagnosis.

Authors: Marc Matrana, Vershalee Shukla, Dallas Kingsbury, Martin Poliak, Jordan Lipton, Matthew McMillin, Louis B Malinow, Oliver Venn, John F

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Beausang, Geoff Stanley, Earl Hubbell, Kathryn N Kurtzman, Jeffrey M Venstrom, Rita Shaknovich, Candace Westgate
Full Source: Nature communications 2025 Oct 31;16(1):9625. doi: 10.1038/s41467-025-64094-7.

Determination of perfluoroalkyl sulfonyl fluorides in environmental water and soil around an abandoned manufactory

2025-10-30
Perfluoroalkyl sulfonyl fluorides (PFASFs), particularly perfluorooctyl sulfonyl fluoride (PFOSF) and perfluorohexyl sulfonyl fluoride (PFHxSF), have attracted significant scientific and regulatory attention following their inclusion in the Stockholm Convention. However, their distribution in environment remains underreported. This study presents a novel analytical method, which combines solvent-induced phase transition extraction with chemical derivatization techniques, enabling the quantitative detection of trace amounts of PFASFs in environmental water using liquid chromatography-tandem mass spectrometry. The developed method demonstrates excellent performance, with good linearity in the concentration range of 25-500 ng L-1, detection limits of 3.50 ng L-1 for PFOSF and 2.71 ng L-1 for PFHxSF, and recoveries ranging from 71 % to 89 % in water. The method was applied to analyze 15 environmental water samples collected near a discontinued fluorochemical manufactory. PFOSF and PFHxSF were successfully detected in wastewater, river water, and surface water, with concentrations ranging from 6.70 to 3761.11 ng L-1 and 277.15-3324.68 ng L-1, respectively. All 20 nearby soil samples yielded 100 % detection frequencies for PFOSF and PFHxSF. Furthermore, C4, C6, and C8 perfluoroalkyl sulfonic acids (PFSAs) were detected in water and soil. Although PFASFs and PFSAs contamination in river water near the plant demonstrated a significant decline between 2023 and 2025, elevated concentrations persisted within the plant's internal systems, and required further attention.
Authors: Junchen Zhu, Mian Bao, Jie Zhou, Hairong Yang, Hongru Feng, Yuanjiang Pan, Cuirong Sun
Full Source: Journal of hazardous materials 2025 Oct 30:499:140285. doi: 10.1016/j.jhazmat.2025.140285.

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OCCUPATIONAL

Mortality Risk from Chronic Ischemic Heart Disease Associated with Short-Term Co-Exposure to Summer Heatwave and Ozone

2025-10-31
Summer heat and air pollution may pose a great threat to public health in the context of climate warming, however, their interactive effects on deaths from chronic ischemic heart disease (CIHD) have not been evaluated in existing investigations. This study aims to assess the associations of concurrent heatwave and ozone pollution with CIHD mortality in Chinese population. We carried out a province-wide, individual-level case-crossover study by analyzing 33,770 CIHD deaths occurring in warm season (May-September) across Jiangsu, eastern China, between 2016 and 2019. Spatially resolved estimates of maximum 8-h average ozone concentrations and air temperatures were estimated on case days and control days at the residential address. Heatwave events were defined using multiple temperature thresholds (percentiles 90-97.5) and durations (2-4 days). Conditional logistic regression model was employed to assess the odds ratio (OR) and its 95% confidence interval (CI) of CIHD death associated with heatwave and ozone exposure. Stratified analyses were performed to compare ozone-related risks on heatwave days versus non-heatwave days, and heatwave-related risks on low-ozone days versus high-ozone days. Additive interactive effects were testified using multiple metrics including relative excess odds due to interaction (REOI), proportion attributable to interaction (AP), and synergy index (SI). In the overall population, the odds of CIHD mortality were 1.010 (95% CI, 1.007-1.014) for a 10-μg/m3 rise in warm-season ozone at lag-01 day and ranged from 1.20 (95% CI, 1.15-1.25) to 1.64 (95% CI, 1.54-1.73) for heatwaves under various definitions. Stratified analyses showed intensified ozone-related CIHD risks on heatwave days compared to non-heatwave days and higher heatwave-related risks on high-ozone days than low-ozone days. We observed significant synergistic interactive effects of heatwave and high-level ozone on CIHD mortality (SI > 1), where the excess risk was elevated by 10-19% (REOI > 0) under co-exposure scenarios, and 8-11% (AP > 0) of the odds could be attributed to the additive interaction. Excess fractions of CIHD deaths attributable to heatwave and high-level ozone among overall populations ranged from 4.73% (95% CI, 3.21-6.25%) to 6.43% (95% CI, 4.33-8.45%) under different heatwave definitions. In stratified analyses, we observed similar

synergistic effects across age groups and among female subgroups only in multiple heatwave definitions. This study provided novel evidence for the synergistical effects of short-term exposure to heatwave and ozone in elevating CIHD death risk and burden. Our findings highlighted the public health urgency of collective response to climate warming crisis and ambient ozone pollution.

Authors: Jiajun Shen, Yu Zhang, Yalin Zhang, Jingjing Zhang, Yixiang Wang, Yuxi Tan, Xiaojie Sun, Hao Zheng, Yunquan Zhang

Full Source: Journal of urban health: bulletin of the New York Academy of Medicine 2025 Oct 31. doi: 10.1007/s11524-025-01007-5.

Prenatal exposure to bisphenols, metals, and risk of fetal chromosome numerical abnormalities in high-risk pregnancies: Independent, combined, and interactive effects

2026-02

Prenatal exposure to bisphenols and metals has raised significant concerns regarding their potential impact on fetal development, particularly the risk of fetal chromosome numerical abnormalities (CNA). In this case-control study, we analyzed bisphenol and metal concentrations in amniotic fluid of high-risk pregnant women undergoing amniocentesis. Concentrations of bisphenols and metals were measured using ultra-performance liquid chromatography-tandem mass spectrometry and inductively coupled plasma-mass spectrometry, respectively. Logistic regression and quantile-based g-computation were applied to evaluate individual and combined effects, while dose-response relationships were assessed using restricted cubic splines. Our findings indicated that bisphenol S (BPS), bisphenol Z (BPZ), bisphenol AF (BPAF), antimony (Sb), and vanadium (V) were significantly associated with an increased risk of CNA when analyzed individually, whereas manganese, iron, copper (Cu), nickel (Ni), and zinc (Zn) were significantly and inversely associated with CNA risk. Combined exposure to bisphenol and metal mixtures was associated with an increased risk of CNA in multi-pollutant models. Cu and Ni exhibited a positive additive interaction. Furthermore, BPS, BPZ, and BPAF were individually associated with an increased risk of Down syndrome, while Zn was associated with a decreased risk of Down syndrome. BPS, Sb, V, and Zn were individually associated with an increased risk of Klinefelter syndrome. These findings underscore the potential role of prenatal bisphenol and