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CONTACT US

subscribers@chemwatch.net
tel +61 3 9572 4700
fax +61 3 9572 4777

1227 Glen Huntly Rd
Glen Huntly
Victoria 3163 Australia

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CHEMICAL EFFECTS

Neurotoxicity of microplastics: a CiteSpace-based review and emerging trends study

2023-07-15

Microplastics, as a currently emerging pollutant, are gaining increasing attention from researchers in various fields. The purpose of this study is to summarize research development on microplastics in the field of neurotoxicity using bibliometric tools and visualization methods and to identify current research hotspots. The Web of Science Core Collection (WoSCC) was searched under the topics of "microplastics" and "neurotoxicity." A total of 33 published articles were obtained by exclusion and analyzed using CiteSpace (V6.1.R2). It was found that microplastic neurotoxicity research is currently on the rise, with the most research results being published in China, the most collaboration occurring between Italy and other countries, and the least collaboration occurring between authors. The focus and hotspots of future research on the neurotoxicity of microplastics may revolve around "accumulation" and "integrated biomarker response." These findings demonstrate the trends and frontiers in the field of microplastic neurotoxicity research and provide valuable information for subsequent research directions and potential collaborations.

Authors: Zeyan Ye, Tingyu Mai, Yuqian Cheng, Xiashuang Zhang, Zhe Liu, Zhiyong Zhang, You Li

Full Source: Environmental monitoring and assessment 2023 Jul 15;195(8):960. doi: 10.1007/s10661-023-11559-1.

Microplastics, as a currently emerging pollutant, are gaining increasing attention from researchers in various fields.

The impact of solvents on the toxicity of the banned parathion insecticide

2023-07-13

The aerial crop dusting and spraying of fields with the phosphorothioate insecticide parathion in the late 1900s, significantly improved crop yields but resulted in high levels of occupational toxicity in handlers and agricultural workers, as well as cases of intentional self-harm poisoning, culminating in its banning in many western countries by early 2000s. However because of the low solubility and volatility of parathion, most available products were formulated using organic solvents e.g. xylene, to increase the efficacy of the aerosols, dusts. In the present study, the toxicity of parathion was assessed when formulated in aqueous solvents (ethanol/PBS (1:9), and delivered to macaques as an aerosol. Doses of

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800 µg/kg and 1.6 mg/kg were delivered one day apart, using a modified nebulizer calculated to result in lung deposition of 380 µg/kg with a similar or larger amount being swallowed; these doses being similar to the estimated lethal oral dose 286ug/kg - 1.43 mg/kg of formulated parathion in humans. Surprisingly, this dose (a combined amount of 14 mg) caused only low AChE inhibition and moderate BChE inhibition with no clinical symptoms, indicating that the use of organic solvents may have previously played a critical role in the severity of parathion toxicity following inhalation exposure. In addition, unlike constitutively toxic OPs, which are highly toxic when inhaled, these results are consistent with the idea that phosphorothioate insecticides, appear to be more intoxicating following oral than inhalation exposure. However, this still remains uncertain because the presence of organic solvents in the ingested parathion studies was not always known.

Authors: Yvonne J Rosenberg, Kelly Garcia, Justin Diener, William Gerk, Scott Donahue, Lingjun Mao, Jonathan Lees, Xiaoming Jiang, Lori A Urban, Dennis Sullivan

Full Source: Chemico-biological interactions 2023 Jul 13;110635. doi: 10.1016/j.cbi.2023.110635.

Emerging aspects of metal ions-doped zinc oxide photocatalysts in degradation of organic dyes and pharmaceutical pollutants - A review

2023-07-14

In recent periods, a broad assortment of continual organic contaminants has been released into our natural water resources. Indeed, it is exceedingly poisonous and perilous to living things; thus, the elimination of these organic pollutants before release into the water bodies is vital. A variety of techniques have been utilized to remove these organic pollutants with advanced oxidation photocatalytic methods with zinc oxide (ZnO) nanoparticles being commonly used as a capable catalyst for contaminated water treatment. Nevertheless, its broad energy gap, which can be only stimulated under an ultraviolet (UV) light source, and high recombination pairs of electrons and holes limit their photocatalytic behaviors. However, numerous methods have been suggested to decrease its energy gap for visible regions. Including, the doping ZnO with metal ions (dopant) can be considered as an effectual route not only the reason for a movement of the absorption edges toward the higher (visible light) region but also to lower the electron-hole pair (e--h+) recombination. This review concentrated on the impact of dissimilar types of metal ions (dopants) on the advancement in the degradation performance of ZnO.

In recent periods, a broad assortment of continual organic contaminants has been released into our natural water resources.

So, this work demonstrates a vital review of contemporary attainments in the alteration of ZnO nanoparticles for organic pollutants eliminations. Besides, the effect of doping ions including transition metals, rare earth metals, and metal ions (substitutional and interstitial) concerning numerous types of altered ZnO are summarized. The photodegradation mechanisms for pristine and metal-modified ZnO nanoparticles are also conferred.
Authors: A Annam Renita, S Sathish, P Senthil Kumar, D Prabu, N Manikandan, A Mohamed Iqbal, G Rajesh, Gayathri Rangasamy
Full Source: Journal of environmental management 2023 Jul 14;344:118614. doi: 10.1016/j.jenvman.2023.118614.

ENVIRONMENTAL RESEARCH

An environmentally friendly approach for industrial wastewater treatment and bio-adsorption of heavy metals using Pistacia soft shell (PSS) through flocculation-adsorption process

2023-07-12
In this research, the potential application of Pistacia soft shell (PSS) was investigated as a novel bio-based flocculant for pulp and paper wastewater (PPWW) treatment. In line with this, after characterization of the PSS, the removal efficiencies of chemical oxygen demand (COD), turbidity and heavy metals (Cu2+ and Pb2+) from PPWW were investigated with different dosage of PSS. The results were compared with alum as a reference flocculant. In addition, the effect of pH adjustment on the flocculation-adsorption performance of PSS was studied under acidic and alkaline condition. Zeta potential, BET, FTIR and SEM as well as kinetics and isotherm analyses were conducted for mechanistic understanding. According to the results, PSS treatment could remove COD, turbidity, Cu2+ and Pb2+ up to 67%, 87%, 70% and 74%, respectively which were better than alum: 56%, 85%, 31% and 35%. It was observed that, pH adjustment significantly improved the performance of PSS treatment. Maximum removal efficiencies of 92%, 95%, 97% and 98% were achieved for COD, turbidity, Cu2+ and Pb2+, respectively, under optimal condition of using 2 g/L PSS at pH 9. The mechanism analysis revealed that the high removal efficiency of PSS is related to the dual flocculation-adsorption of bridging and sweeping mechanisms. The results of this study suggested

In this research, the potential application of Pistacia soft shell (PSS) was investigated as a novel bio-based flocculant for pulp and paper wastewater (PPWW) treatment.

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PSS as a promising, sustainable and eco-friendly bio-based flocculant and adsorbent for industrial wastewater treatment.
Authors: Bahman Nazari, Saba Abdolalian, Mohsen Taghavijeloudar
Full Source: Environmental research 2023 Jul 12;116595. doi: 10.1016/j.envres.2023.116595.

integrated environmental health assessment: proposed approaches to exposure during chemical incidents

2023-07-14
An integrated environmental health exposure assessment (IEHA) refers to the integration of human biomonitoring data (HBM) and environmental measurements and aims to optimise the exposure assessment process. Due to lack of data, this approach remains an issue during chemical incidents. This study aims to explore integrated exposure approaches for assessing human health risks during chemical incidents. Based on the Preferred Reporting Items of Systematic reviews and Meta-Analyses statement, a literature analysis was performed. A level of confidence ranging from 1 to 4 was established to define quality and strength of data used to undertake an IEHA approach. 27 articles (n=18) and texts (n=9) from Europe (41%) and the United States (37%) were analysed. Among the 18 scientific articles, 61% (n=11) presented a quantitative approach, and 17% (n=3) a qualitative approach. Quantitative approaches must be based on accurate data, coupled with predictive models. Of all the scientific papers, 40% (n=7) responded to a confidence level greater than or equal to 2. Uncertainties detected through the integrated exposure approaches were related to input data, analytical methods and HBM reference values interpretations. During chemical incidents, direct measurements were the most relevant data. Few scientific studies have developed an integrated approach during emergency situations. However, when this was used, they presented a high level of confidence by defining levels of exposure which support decision-making processes. Despite the multiple approaches, there was a lack of guidelines allowing an integrated risk assessment to be performed during an emergency chemical exposure.
Authors: Rasoloharimahefa-Rasamoela Michele, Bouland Catherine
Full Source: Integrated environmental assessment and management 2023 Jul 14. doi: 10.1002/ieam.4810.

An integrated environmental health exposure assessment (IEHA) refers to the integration of human biomonitoring data (HBM) and environmental measurements and aims to optimise the exposure assessment process.

PHARMACEUTICAL/TOXICOLOGY

Drug approval prediction based on the discrepancy in gene perturbation effects between cells and humans

2023-07-13

Background: Poor translation between in vitro and clinical studies due to the cells/humans discrepancy in drug target perturbation effects leads to safety failures in clinical trials, thus increasing drug development costs and reducing patients' life quality. Therefore, developing a predictive model for drug approval considering the cells/humans discrepancy is needed to reduce drug attrition rates in clinical trials.

Methods: Our machine learning framework predicts drug approval in clinical trials based on the cells/humans discrepancy in drug target perturbation effects. To evaluate the discrepancy to predict drug approval (1404 approved and 1070 unapproved drugs), we analysed CRISPR-Cas9 knockout and loss-of-function mutation rate-based gene perturbation effects on cells and humans, respectively. To validate the risk of drug targets with the cells/humans discrepancy, we examined the targets of failed and withdrawn drugs due to safety problems.

Findings: Drug approvals in clinical trials were correlated with the cells/humans discrepancy in gene perturbation effects. Genes tolerant to perturbation effects on cells but intolerant to those on humans were associated with failed drug targets. Furthermore, genes with the cells/humans discrepancy were related to drugs withdrawn due to severe side effects. Motivated by previous studies assessing drug safety through chemical properties, we improved drug approval prediction by integrating chemical information with the cells/humans discrepancy.

Interpretation: The cells/humans discrepancy in gene perturbation effects facilitates drug approval prediction and explains drug safety failures in clinical trials.

Funding: S.K. received grants from the Korean National Research Foundation (2021R1A2B5B01001903 and 2020R1A6A1A03047902) and IITP (2019-0-01906, Artificial Intelligence Graduate School Program, POSTECH).

Authors: Minhyuk Park, Donghyo Kim, Inhae Kim, Sin-Hyeog Im, Sanguk Kim

Full Source: EBioMedicine 2023 Jul 13;94:104705. doi: 10.1016/j.ebiom.2023.104705.

Background: Poor translation between in vitro and clinical studies due to the cells/humans discrepancy in drug target perturbation effects leads to safety failures in clinical trials, thus increasing drug development costs and reducing patients' life quality.

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Per- and polyfluoroalkyl substances in ambient fine particulate matter in the Pearl River Delta, China: Levels, distribution and health implications

2023-07-13

Per- and polyfluoroalkyl substances (PFAS) have attracted worldwide attention as one of persistent organic pollutants; however, there is limited knowledge about the exposure concentrations of PFAS-contained ambient particulate matter and the related health risks. This study investigated the abundance and distribution of 32 per- and polyfluoroalkyl substances (PFAS) in fine particulate matter (PM2.5) collected from 93 primary or secondary schools across the Pearl River Delta region (PRD), China. These chemicals comprise four PFAS categories which includes perfluoroalkyl carboxylic acids (PFCAs), perfluoroalkyl sulfonic acids (PFSAs), perfluoroalkyl acid (PFAA) precursors and PFAS alternatives. In general, concentrations of target PFAS ranged from 11.52 to 419.72 pg/m3 (median: 57.29 pg/m3) across sites. By categories, concentrations of PFSAs (median: 26.05 pg/m3) were the dominant PFAS categories, followed by PFCAs (14.25 pg/m3), PFAS alternatives (2.75 pg/m3) and PFAA precursors (1.10 pg/m3). By individual PFAS, PFOS and PFOA were the dominant PFAS, which average concentration were 24.18 pg/m3 and 6.05 pg/m3, respectively. Seasonal variation showed that the concentrations of PFCAs and PFSAs were higher in winter than in summer, whereas opposite seasonal trends were observed in PFAA precursors and PFAS alternatives. Estimated daily intake (EDI) and hazard quotient (HQ) were used to assess human inhalation-based exposure risks to PFAS. Although the health risks of PFAS via inhalation were insignificant (HQ far less than one), sufficient attention should be levied to ascertain the human exposure risks through inhalation, given that exposure to PFAS through air inhalation is a long term and cumulative process.

Authors: Lu-Sheng Liu, Yu-Ting Guo, Qi-Zhen Wu, Mohammed Zeeshan, Shuang-Jian Qin, Hui-Xian Zeng, Li-Zi Lin, Wei-Chun Chou, Yun-Jiang Yu, Guang-Hui Dong, Xiao-Wen Zeng

Full Source: Environmental pollution (Barking, Essex : 1987) 2023 Jul 13;122138. doi: 10.1016/j.envpol.2023.122138

Per- and polyfluoroalkyl substances (PFAS) have attracted worldwide attention as one of persistent organic pollutants; however, there is limited knowledge about the exposure concentrations of PFAS-contained ambient particulate matter and the related health risks.

OCCUPATIONAL

Prenatal Exposure to Nitrate in Drinking Water and Adverse Health Outcomes in the Offspring: a Review of Current Epidemiological Research

2023-07-16

Purpose of review: Recently, several epidemiological studies have investigated whether prenatal exposure to nitrate from drinking water may be harmful to the fetus, even at nitrate levels below the current World Health Organization drinking water standard. The purpose of this review was to give an overview of the newest knowledge on potential health effects of prenatal exposure to nitrate.

Recent findings: We included 13 epidemiological studies conducted since 2017. Nine studies investigated outcomes appearing around birth, and four studies investigated health outcomes appearing in childhood and young adulthood. The reviewed studies showed some indications of higher risk of preterm delivery, lower birth weight, birth defects, and childhood cancer related to prenatal exposure to nitrate. However, the numbers of studies for each outcome were sparse, and some of the results were conflicting. We suggest that there is a need for additional studies and particularly for studies that include information on water consumption patterns, intake of nitrate from diet, and intake of nitrosatable drugs.

Authors: Pernille Jul Clemmensen, Jörg Schullehner, Nis Brix, Torben Sigsgaard, Leslie Thomas Stayner, Henrik Albert Kolstad, Cecilia Høst Ramlau-Hansen

Full Source: Current environmental health reports 2023 Jul 16. doi: 10.1007/s40572-023-00404-9.

Purpose of review: Recently, several epidemiological studies have investigated whether prenatal exposure to nitrate from drinking water may be harmful to the fetus, even at nitrate levels below the current World Health Organization drinking water standard.

Novel Insights into the Dermal Bioaccessibility and Human Exposure to Brominated Flame Retardant Additives in Microplastics

2023-07-14

In this study, we optimized and applied an in vitro physiologically based extraction test to investigate the dermal bioaccessibility of polybrominated diphenyl ethers (PBDEs) and hexabromocyclododecane (HBCDD), incorporated as additives in different types of microplastics (MPs), and assess human dermal exposure to these chemicals. The dermal bioaccessibility of PBDEs in polyethylene (PE) MPs was significantly higher ($P < 0.05$) than in polypropylene (PP) MPs. Both log Kow and water solubility influenced the dermal bioaccessibility of PBDEs. For HBCDDs in polystyrene MPs, the dermally bioaccessible fractions were 1.8, 2.0, and 1.6% of the applied dose for α-, β-, and γ-HBCDDs, respectively. MP particle size and the presence of cosmetic formulations (antiperspirant, foundation, moisturizer and sunscreen) influenced the bioaccessibility of PBDEs and HBCDDs in MP matrices at varying degrees of significance. Human exposure to ∑PBDEs and ∑HBCDDs via dermal contact with MPs ranged from 0.02 to 22.2 and 0.01 to 231 ng (kg bw)-1 d-1 and from 0.02 to 6.27 and 0.2 to 65 ng (kg bw)-1 d-1 for adults and toddlers, respectively. Dermal exposure to PBDEs and HBCDDs in MPs is substantial, highlighting for the first time the significance of the dermal pathway as a major route of human exposure to additive chemicals in microplastics.

Authors: Ovokeroye A Abafe, Stuart Harrad, Mohamed Abou-Elwafa Abdallah

Full Source: Environmental science & technology 2023 Jul 14. doi: 10.1021/acs.est.3c01894.

Association of oral health with various work problems: a cross-sectional study of Japanese workers

2023-07-15

Background: Oral diseases affect quality of life and known to decrease productivity. We examined the impact of oral health status on various types of work problems.

Methods: This cross-sectional study used data from an internet-based self-report questionnaire survey administered to workers in Japan. Responses to the questionnaire regarding seven types of oral health-related work problems:

1. Stress
2. Lack of focus
3. Lack of sleep
4. Lack of energy
5. Lack of communication due to halitosis
6. Lack of communication due to appearance
7. Lack of ability due to dental-related pain) were investigated and statistically analyzed.

Explanatory variables were self-reported oral health status, number of teeth, and gum bleeding. To examine the association of oral health with the presence of work problems, logistic regression analysis was used to estimate the odds ratio (OR) and 95% confidence interval (CI). Age, sex, educational attainment, income, the presence of diabetes, and industrial classifications were used as the covariates.

Background: Oral diseases affect quality of life and known to decrease productivity.

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Results: A total of 3,930 workers (mean age: 43.3 (SD = 11.7), 2,057 males and 1,873 females) were included. Overall, a total of 6.2% of workers reported having at least one oral health-related work problem in the past year, whereas 21.8% of those with poor self-reported oral health reported work problems. Workers with poor self-reported oral health were 3.58 (95% CI (1.70-7.56) times higher odds of reporting work problems than those with excellent self-reported oral health.
Conclusions: Oral health was found to be associated with various work problems. Oral health promotion policies are needed in the workplace.
Authors: Satomi Shimada, Takashi Zaitsu, Akiko Oshiro, Shiho Kino, Jun Aida
Full Source: BMC oral health 2023 Jul 15;23(1):488. doi: 10.1186/s12903-023-03196-4.

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