CHEMWATCH

Bulletin Board

Contents

JUN. 30, 2023

(click on page numbers for links)

CONTACT US

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

1227 Glen Huntly Rd
Glen Huntly
Victoria 3163 Australia

CHEMICAL EFFECTS

Screening and prioritization of organic chemicals in a large river basin by suspect and non-target analysis

2023-06-21

Many organic chemicals are present in aquatic environments, but how to screen and prioritize these chemicals has always been a difficult task. Here we investigated organic chemicals in the West River Basin by using a developed non-target identification workflow. A total of 957 chemicals were tentatively identified, with 96 assigned as high confidence levels by matching with reference standards, MassBank spectral library, and using CompTox Chemistry Dashboard database as the compound library for MetFrag. More pesticides and their transformation products (e.g., metolachlor ESA, acetochlor ESA, deethylatrazine, and hydroxyatrazine) were detected in the wet season due to the increasing usage. High detection of pharmaceutical and personal care products and their transformation products in the tributaries was linked to rural farming and human activities. Irbesartan that is used to treat high blood pressure was recognized in the river and positive correlations between some detected chemicals and irbesartan were observed, indicating a domestic wastewater source. Ecological risks of the identified chemicals were calculated by toxicological prioritization ranking schemes, and 24 chemicals showed high ToxPi scores in the river. The results from this study show the presence of a large number of emerging organic chemicals in our waterways, and demonstrated conceptual schemes for integrating risk assessment into a non-target screening workflow.Body of article

Authors: Jia-Hui Zhao, Li-Xin Hu, Sheng Xiao, Jian-Liang Zhao, You-Sheng Liu, Bin Yang, Qian-Qian Zhang, Guang-Guo Ying

Full Source: Environmental pollution (Barking, Essex : 1987) 2023 Jun 21;333:122098. doi: 10.1016/j.envpol.2023.122098.

Many organic chemicals are present in aquatic environments, but how to screen and prioritize these chemicals has always been a difficult task.

A preliminary study about the potential risks of the UV-weathered microplastic: The proteome-level changes in the brain in response to polystyrene derived weathered microplastics

2023-06-22

The growing use of plastic materials has resulted in a constant increase in the risk associated with microplastics (MPs). Ultra-violet (UV) light and wind break down modify MPs in the environment into smaller particles known as weathered MPs (WMPs) and these processes increase the risk

CHEMWATCH
Bulletin Board
Technical
JUN. 30, 2023

of MP toxicity. The neurotoxicity of weathered polystyrene-MPs remains unclear. Therefore, it is important to understand the risks posed by WMPs. We evaluated the chemical changes of WMPs generated under laboratory-synchronized environmentally mimetic conditions and compared them with virgin MPs (VMPs). We found that WMP had a rough surface, slight yellow color, reduced molecular weight, and structural alteration compared with those of VMP. Next, 2 μg of 100 μm in size of WMP and VMP were orally administered once a day for one week to C57BL/6 male mice. Proteomic analysis revealed that the WMP group had significantly increased activation of immune and neurodegeneration-related pathways compared with that of the VMP group. Consistently, in in vitro experiments, the human brain-derived microglial cell line (HMC-3) also exhibited a more severe inflammatory response to WMP than to VMP. These results show that WMP is a more profound inflammatory factor than VMP. In summary, our findings demonstrate the toxicity of WMPs and provide theoretical insights into their potential risks to biological systems and even humans in the ecosystem.

Authors: Hee-Yeon Kim, Janbolat Ashim, Song Park, Wansoo Kim, Sangho Ji, Seoung-Woo Lee, Yi-Rang Jung, Sang Won Jeong, Se-Guen Lee, Hyun-Chul Kim, Young-Jae Lee, Mi Kyung Kwon, Jun-Seong Hwang, Jung Min Shin, Sung-Jun Lee, Wookyung Yu, Jin-Kyu Park, Seong-Kyoon Choi

Full Source: Environmental research 2023 Jun 22;233:116411. doi: 10.1016/j.envres.2023.116411

ENVIRONMENTAL RESEARCH

Environmental and agronomic assessment of soil conditioners produced from bauxite residue and oil palm wastes

2023-06-21

Soil conditioner is class of products used to enhance physics, physicochemical or soil biological activities, being able to recover disturbed or nutritional unbalanced soils. The formulation of a soil conditioner composed by bauxite residue (BR), and organic oil palm wastes, as raw materials, was recently proposed as an innovative strategy for the Brazilian acid soils amendment. Here we show the results of soil conditioner amended soil leaching tests and agronomical performance. The soil conditioners were formulated by BR mixed with decomposed POC (palm oil compost) and non-decomposed POMW (palm oil mill waste) oil palm wastes, in the proportion of 25% BR + 75% POC (T1) and 50% BR +

Soil conditioner is class of products used to enhance physics, physicochemical or soil biological activities, being able to recover disturbed or nutritional unbalanced soils.

50% POMW (T2), in addition to the treatment with 100% POMW without BR (T3) and limestone at a dose calculated to raise soil pH to 6.0 (T4). Except for T4, all conditioners were applied to the soil at doses of 40, 80, and 120 t ha-1 for leaching tests. The experimental plots were composed of polyvinyl chloride columns, filled with 5 kg of soil, with bottles adapted with hoses at the bottom to facilitate drainage of the leachate. After leaching tests, the respective columns were used as pots for the cultivation of Brachiaria grass, stage with addition of a control composed by undisturbed soil (T5). The pH of the leachates had changes, but the use of BR associated with POMW was similar to the use of limestone. Of the 65 chemical elements evaluated, only nine were identified in the leachate, being most of them considered as plant nutrients. As for soil pH, limestone was slightly higher (6.6) than treatments that had BR (5.5). Brachiaria grass cultivated in the soil amended with conditioners showed similar results of limestone treated soil for the parameters of plant development and showed fertility improvement.

Authors: Robson da Costa Leite, Adriano Reis Lucheta, Roseanne Barata Holanda, Patricia Magalhães Pereira Silva, André Luiz Vilaça do Carmo, Fernando Gama Gomes, Rubson da Costa Leite, Caio Cesar Amorim de Melo, Raphael Vieira da Costa, Marcelo Montini, Antonio Rodrigues Fernandes

Full Source: Environmental research 2023 Jun 21;116474. doi: 10.1016/j.envres.2023.116474.

Novel polymer optical fibers with high mass-loading g-C3N4 embedded metamaterial porous structures achieve rapid micropollutant degradation in water

2023-06-15

The performance of conventional photocatalytic reactors suffers from low photocatalyst mass-loading densities affixed to surfaces and light scattering losses or light attenuation in slurry reactors. These limitations are overcome by fabrication of high mass-loading g-C3N4 embedded metamaterial porous structures on flexible polymeric optical fibers (g-C3N4-POFs). In this study, the fabricated g-C3N4-POFs contain g-C3N4 with mass-loading 100-1000x higher than previouly reported, enabling efficient light delivery to g-C3N4 and improved pollutant mass transport within metamaterial porous structures. The key fabrication step involved using acetone, based on its high saturated vapor pressure and low dielectric constant, making roll-to-roll mass production of high mass-loading photocatalyst-embedded metamaterial POFs possible at room-temperature within seconds. Using bundles of 150 individual

The performance of conventional photo-catalytic reactors suffers from low photocatalyst mass-loading densities affixed to surfaces and light scattering losses or light attenuation in slurry reactors.

CHEMWATCH
Bulletin Board
Technical
JUN. 30, 2023

g-C3N4-POFs in the reactors, we achieved 4x higher degradation rates for micropollutants under visible light irradiation at 420 nm compared with equivalent mass-to-volume ratios of photocatalysts in a slurry suspension reactor. The bundled g-C3N4-POF reactor showed no degradation in the structural integrity or loss of pollutant degradation using deionized or model drinking water under accumulated HO• exposures of 4.5 × 10-9 M•s after 20 cycles of treatment. It operates continuously at g-C3N4 dosages equivalent to 100-1000 g/L and a water depth over 40 cm, making it a feasible alternative to conventional photocatalytic reactors.

Authors: Zihang Cheng, Chii Shang, Paul Westerhoff, Li Ling\

Full Source: The Science of the total environment 2023 Jun 22;165044. doi: 10.1016/j.scitotenv.2023.165044.

Plasmonic nanoparticle's anti-aggregation application in sensor development for water and wastewater analysis

2023-06-23

Colorimetric sensors have emerged as a powerful tool in the detection of water pollutants. Plasmonic nanoparticles use localized surface plasmon resonance (LSPR)-based colorimetric sensing. LSPR-based sensing can be accomplished through different strategies such as etching, growth, aggregation, and anti-aggregation. Based on these strategies, various sensors have been developed. This review focuses on the newly developed anti-aggregation-based strategy of plasmonic nanoparticles. Sensors based on this strategy have attracted increasing interest because of their exciting properties of high sensitivity, selectivity, and applicability. This review highlights LSPR-based anti-aggregation sensors, their classification, and role of plasmonic nanoparticles in these sensors for the detection of water pollutants. The anti-aggregation based sensing of major water pollutants such as heavy metal ions, anions, and small organic molecules has been summarized herein. This review also provides some personal insights into current challenges associated with anti-aggregation strategy of LSPR-based colorimetric sensors and proposes future research directions.

Authors: Shailja Pandey, Shipra Mital Gupta, Surendra Kumar Sharma

Full Source: Environmental monitoring and assessment 2023 Jun 23;195(7):874. doi: 10.1007/s10661-023-11355-x.

Colorimetric sen-sors have emerged as a powerful tool in the detection of water pollutants.

PHARMACEUTICAL/TOXICOLOGY

Multidrug-resistant Enterobacter spp. in wastewater and surface water: Molecular characterization of β-lactam resistance and metal tolerance genes

2023-06-23

mong the ESKAPE group pathogens, Enterobacter spp. is an opportunistic Gram-negative bacillus, widely dispersed in the environment, that causes infections. In the present study, samples of hospital wastewater, raw and treated urban wastewater, as well as surface receiving water, were collected to assess the occurrence of multidrug-resistant (MDR) Enterobacter spp. A molecular characterization of β-lactam antibiotic resistance and metal tolerance genes was performed. According to identification by MALDI-TOF MS, 14 isolates were obtained: 7 E. bugandensis, 5 E. kobei, and 2 E. cloacae. The isolates showed resistance mainly to β-lactam antibiotics, including those used to treat infections caused by MDR bacteria. Multiple antibiotic resistance index was calculated for all isolates. It allowed verify whether sampling points showed a high risk due to antibiotic resistant Enterobacter spp., as well as to determine if the isolates have been in environments with a frequent antibiotic use. Twelve isolates showed β-lactam antibiotic resistance gene, being the blaKPC widely detected. Regarding metal tolerance, 13 isolates showed at least two genes that encode metal tolerance mechanisms. Overall, metal tolerance mechanisms to silver, copper, mercury, arsenic and tellurium were found. New data on metal tolerance mechanisms dispersion and antibiotic-resistance characterization of the E. bugandensis and E. kobei species were here provided. The occurrence of MDR Enterobacter spp. in analyzed samples draws attention to an urgent need to put control measures into practice. It also evidences waterborne spread of clinically important antibiotic-resistant bacteria recognized as critical priority pathogens.

mong the ESKAPE group pathogens, Enterobacter spp.

Authors: Guilherme Sgobbi Zagui, Natália Columbaro Moreira, Danilo Vitorino Santos, Cristina Filomena Pereira Rosa Paschoalato, Jordi Sierra, Martí Nadal, José L Domingo, Ana Lúcia Costa Darini, Leonardo Neves Andrade, Susana Inés Segura-Muñoz

Full Source: Environmental research 2023 Jun 23;116443. doi: 10.1016/j.envres.2023.116443.

CHEMWATCH
Bulletin Board
Technical
JUN. 30, 2023

Clearance of intracellular bacterial infections by hyaluronic acid-based ROS responsive drug delivery micelles

2023-06-23

Pathogenic bacteria residing inside cells could cause disruption of cellular metabolic balance. Therefore, basing on high oxidative stress response of the intracellular bacteria infected micro-environment, a novel amphipathic micelle (HATAD-TCS) was developed consisting of hyaluronic acid-derivative and reactive oxygen species (ROS) - responsive group and antibacterial agent triclosan (TCS). ROS-generating cinnamaldehyde (CA) was incorporated into ROS-cleavable linkages which are future linked to the 1-decylamine to form hydrophobicity. The cinnamaldehyde released did not just killed bacteria however, also maintained intracellular ROS levels. In this study, the HATAD-TCS micelles have been characterized by scanning electron microscopy (SEM) and dynamic light scattering (DLS). The HATAD-TCS micelles could release drug gradually upon exposure to endogenous ROS being caused by infected intracellular bacteria. Furthermore, the more promising therapeutic effect of the HATAD-TCS micelles was observed in a mouse pneumonia model. These results might highlight a ROS-responsive hyaluronic acid-based nanoparticle, which could effectively treat intracellular bacterial infections.

Pathogenic bacteria residing inside cells could cause disruption of cellular metabolic balance.

Authors: Yuanhao Qiu, Kun Shang, Ningning Xu, Peng Chen, Huashan Gao, Haibo Mu, Wenpo Feng, Jinyou Duan

Full Source: International journal of biological macromolecules 2023 Jun 23;125506. doi: 10.1016/j.ijbiomac.2023.125506.

Emerging contaminants in conventional and advanced biological nutrient removal based wastewater treatment plants in India- insights into the removal processes

2023-06-22

Emerging contaminants (ECs) in the environment are a cause of concern due to their potential toxic effects. The study investigates the fate of 20 ECs covering a wide range of physical-chemical properties in ten full-scale municipal wastewater treatment plants (WWTPs). The plants were based on conventional technologies such as waste stabilization pond, upflow sludge blanket reactor, activated sludge process, and biological nutrient removal-based technologies such as anoxic-aerobic process, anaerobic-anoxic-aerobic process, biodenipho process, sequencing batch reactor, and densadeg-biofor process. Covering all the wastewater and sludge treatment lines, the mass balance approach was followed to investigate the fate of ECs at each treatment stage. The amount of ECs entering and

leaving the WWTPs ranged from 0.82 to 11.94 kg/day and 0.027-0.70 kg/day, respectively. Antibiotics showed limited removal and were detected in the 0.006-0.18 kg/day range. The ECs were mainly detected in the aqueous phase in all the treatment steps. However, the contribution from the particulate and sludge phase cannot be neglected. The sorption of ECs on sludge depended on the sludge's characteristics. It was found to be the highest in the primary sludge. The measured sorption coefficient indicated that both hydrophobic and electrostatic interactions of ECs with the sludge are insufficient in explaining the sorption behaviour of a contaminant. The mass balance studies show biodegradation as the major removal pathway in all the WWTPs. The study provides the environmental mass load of ECs from Indian WWTPs. It will help understand the removal mechanisms of ECs in different types of wastewater treatment techniques.

Authors: Monika Dubey, Bhanu Prakash Vellanki, Absar Ahmad Kazmi

Full Source: The Science of the total environment 2023 Jun 22;165094. doi: 10.1016/j.scitotenv.2023.165094.

OCCUPATIONAL

Does occupational health surveillance lead to risk reduction for workers exposed to hand-intensive work?

2023-06-21

This mixed method study aimed to describe what risk-reducing actions were proposed by ergonomists after the execution of a guided process for occupational health surveillance for workers exposed to hand-intensive work in ten companies. Another aim was to describe the exposed workers' proposals for risk-reducing actions, including their perceptions of potential changes in the self-assessed exposure levels and work-related pain. Several actions, targeting organizational, technical, and/or individual measures were proposed. Proposals from the ergonomists more often targeted the personal measures, whereas the workers' proposals targeted technology or organizational changes. Six companies implemented at least one of the action proposals. These action proposals were not related to evaluation metrics, nor were they evaluated. This study indicates that both ergonomists and companies need guidance on how to improve to work in a participatory process for the implementation and evaluation of risk-reducing actions, e.g., by how to better include workers' experiences.

Authors: Kristina Eliasson, Charlotte Lewis, Therese Hellman, Gunilla Dahlgren, Magnus Svartengren, Teresia Nyman

Full Source: Applied ergonomics 2023 Jun 21;112:104074. doi: 10.1016/j.apergo.2023.104074.

This mixed method study aimed to describe what risk-reducing actions were proposed by ergonomists after the execution of a guided process for occupational health surveillance for workers exposed to hand-intensive work in ten companies.

CHEMWATCH
Bulletin Board
Technical
JUN. 30, 2023

Health effects of railway-induced vibration combined with railway noise - A systematic review with exposure-effect curves

2023-06-21

Background: The combined health impact of concurrent railway noise and railway vibration exposure is not yet well understood.
Objectives: This systematic review gives an overview of epidemiological studies on health effects from railway vibration, aiming to quantify this association with exposure-effect curves. Moreover, the combined health effects of vibration and concurrent noise were investigated.
Methods: We converted the vibration metric to an equivalent noise level and calculated an overall noise level by energetically summing the equivalent and railway noise level. The combined health effect was determined by using published evidence-based exposure-effect formulas.
Results: Studies included in this systematic review predominately investigated annoyance and self-reported sleep disturbances; no studies on manifest diseases were identified. For the combined effects of vibration and noise on "total" annoyance, the results based on the pooled analysis of CargoVibes project are recommended as conservative approach.
Discussion: Converting railway vibration into equivalent noise levels in dB may offer a pragmatic approach to assess the combined health effects of railway noise and railway vibration exposure. Future studies should include cardiovascular and mental diseases in addition to vibration-induced annoyance and sleep disturbances. Furthermore, future studies should include in-depth investigations of the interaction between railway noise and railway vibration to allow for a more accurate assessment of the railway-induced burden of disease.

Authors: Andreas Seidler, Melanie Schubert, Yasmin Mehrjerdian, Klaus Krapf, Christian Popp, Irene van Kamp, Mikael Ögren, Janice Hegewald

Full Source: Environmental research 2023 Jun 21;116480. doi: 10.1016/j.envres.2023.116480.

Background: The combined health impact of concurrent railway noise and railway vibration exposure is not yet well understood.
.