CHEMWATCH

Bulletin Board

Contents

NOV. 10, 2023

(click on page numbers for links)

CHEMICAL EFFECTS

Non-coding RNAs: A new frontier in Benzene-mediated toxicity 3

Mass transfer characteristics of chiral pharmaceuticals on membrane used for polar organic chemical integrative sampler 3

Olive mill wastewater treatment using natural adsorbents: phytotoxicity on durum wheat (Triticum turgidum L. var. durum) and white bean (Phaseolus vulgaris L.) seed germination..... 4

ENVIRONMENTAL RESEARCH

Co-exposure of microplastics and heavy metals in the marine environment and remediation techniques: a comprehensive review..... 5

Process modeling, environmental and economic sustainability of the valorization of whey and eucalyptus residues for resveratrol biosynthesis..... 6

Adsorption and photocatalytic applications of porphyrin-based materials for environmental separation processes: A review..... 7

PHARMACEUTICAL/TOXICOLOGY

Efficient treatment of actual glyphosate wastewater via non-radical Fenton-like oxidation..... 8

Application of life cycle assessment to high-soil conditioner production from biowaste 8

OCCUPATIONAL

Prenatal exposure to replacement flame retardants and organophosphate esters and childhood adverse respiratory outcomes..... 9

Temporal changes of exposure to water on physic-chemical, stability, and transport characteristics of pyrogenic carbon colloids 10

CONTACT US

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

1227 Glen Huntly Rd
Glen Huntly
Victoria 3163 Australia

Copyright Chemwatch 2023 ©

CHEMICAL EFFECTS

Non-coding RNAs: A new frontier in Benzene-mediated toxicity

2023-11-02

One of the most frequent environmental contaminants, benzene is still widely used as an industrial solvent around the world, especially in developing nations, posing a serious occupational risk. While the processes behind the toxicity of benzene grounds are not fully understood, it is generally accepted that its metabolism, which involves one or more reactive metabolites, is crucial to its toxicity. In order to evaluate the many ways that benzene could influence gene regulation and thus have an impact on human health, new methodologies have been created. The pathophysiology of the disorder may result from epigenetic reprogramming caused by exposure to benzene, including changes in non-coding RNA (ncRNA) markers, according to recent studies. We are interested in the identification of hazardous regulatory ncRNAs, the identification of these ncRNAs' targets, and the comprehension of the significance of these interactions in the mechanisms behind benzene toxicity. Hence, the focus of recent research is on long non-coding RNAs (lncRNAs), circular RNAs (circRNAs) and microRNAs (miRNAs), and some of the more pertinent articles are also discussed.

Authors: Amir Hosein Sanjari Nia, Mehran Reyhani-Ardabili, Maryam Sheikhvand, Saeid Bagheri-Mohammadi, Hadi Niknejad, Hassan Rasoulzadeh, Abolfazl Movafagh, Sam Kharazi Neghad, Mohammad Baniasadi, Ahad Ashraf-Asgarabad, Mobina Hosseini, Seyed Mohsen Aghaei-Zarch

Full Source: Toxicology 2023 Nov 2:153660. doi: 10.1016/j.tox.2023.153660.

Mass transfer characteristics of chiral pharmaceuticals on membrane used for polar organic chemical integrative sampler

2024-02

Passive sampling technology has good application prospects for monitoring trace pollutants in aquatic environments. Further research on the sampling mechanism of this technology is essential to improve the measurement accuracy and extend the application scope of this approach. In this study, adsorption and permeation experiments were performed to investigate the sorption and mass transfer properties of five chiral pharmaceuticals at the enantiomeric level on polyethersulfone

One of the most frequent environmental contaminants, benzene is still widely used as an industrial solvent around the world, especially in developing nations, posing a serious occupational risk.

CHEMWATCH
Bulletin Board
Technical
NOV. 10, 2023

(PES) and polytetrafluoroethylene (PTFE) membranes used in a polar organic chemical integrative sampler. Batch adsorption experiments showed that the PES membrane had an adsorption phenomenon for most selected pollutants and an insignificant sorption behavior was observed for all selected pharmaceuticals on the PTFE membrane except for R(S)-fluoxetine. The diffusion coefficients of selected pharmaceuticals onto the PTFE membrane were approximately one order of magnitude higher than those onto the PES membrane. The permeation experiment indicated that under different hydraulic conditions, the change of the relative pollutant concentration through the PTFE membrane for the composite pollutant system was more obvious than that for the single pollutant system, and mass transfer hysteresis exists for both contaminant systems through PES membranes. Using the first-order equation or 3-component model to estimate the overall mass transfer coefficients, the results showed that the overall mass transfer coefficient values of pollutants in the composite pollutant system onto both membranes were higher than those in the single pollutant system. This parameter was mainly influenced by the synergistic effects of the multi-analyte interaction and diminished water boundary layers during the mass transfer process.

Authors: Liyang Wang, Ruixia Liu, Youya Zhou, Peng Yuan, Xiaoling Liu, Hongjie Gao

Full Source: Journal of environmental sciences (China) 2024 Feb:136:670-681. doi: 10.1016/j.jes.2023.02.038.

Olive mill wastewater treatment using natural adsorbents: phytotoxicity on durum wheat (Triticum turgidum L. var. durum) and white bean (Phaseolus vulgaris L.) seed germination

2023-10

This research was undertaken to optimize the phenolic compound removal from Olive Mill Wastewater (OMW) by sawdust and red clay as natural adsorbents. Fractional factorial experimental design at 25-1 was used in order to optimize the experimental conditions for high removal efficiency. Statistics ANOVA analysis, Fisher's test, and Student's test suggested that the adsorbent dose has the most significant influence on polyphenol removal for both adsorbents. The maximum removal of polyphenols by sawdust reached 49.6% at 60 °C by using 60 g/L of adsorbent dose, pH 2, reaction time of 24 h, and agitation speed of 80 rpm. Whereas, for red clay, 48.08% of polyphenols removal was observed under the same conditions for sawdust except the temperature of 25 °C instead of 60 °C. In addition, the thermodynamic parameters suggested

This research was undertaken to optimize the phenolic compound removal from Olive Mill Wastewater (OMW) by sawdust and red clay as natural adsorbents.

spontaneous process for both adsorbents, endothermic for the sawdust and exothermic for red clay. Furthermore, the phytotoxicity effect of OMW on durum wheat (Triticum turgidum L. var. durum) and white bean (Phaseolus vulgaris L.) seed germination was investigated. The obtained results showed that the untreated OMW inhibited the seed germination of T. turgidum and P. vulgaris seeds. OMW treatment with red clay followed by dilution (95% water) resulted in 87 and 30% germination of P. vulgaris and T. turgidum, respectively. While, the treatment of OMW with sawdust and dilution at 95% resulted in 51 and 26% germination of P. vulgaris and T. turgidum, respectively.

Authors: Fatima Elayadi, Mounia Achak, Wafaa Boumya, Noureddine Barka, Edvina Lamy, Chakib El Adlouni

Full Source: Environmental science and pollution research international 2023 Oct;30(50):109481-109499. doi: 10.1007/s11356-023-29741-w.

ENVIRONMENTAL RESEARCH

Co-exposure of microplastics and heavy metals in the marine environment and remediation techniques: a comprehensive review

2023-11-03

Microplastics (MPs) and heavy metals are significant pollutants in the marine environment, necessitating effective remediation strategies to prevent their release into the sea through sewage and industrial effluent. This comprehensive review explores the current understanding of the co-exposure of MPs and heavy metal-enriched MPs, highlighting the need for effective remediation methods. Various mechanisms, including surface ion complexation, hydrogen bonding, and electrostatic forces, contribute to the adsorption of heavy metals onto MPs, with factors like surface area and environmental exposure duration playing crucial roles. Additionally, biofilm formation on MPs alters their chemical properties, influencing metal adsorption behaviors. Different thermodynamic models are used to explain the adsorption mechanisms of heavy metals on MPs. The adsorption process is influenced by various factors, including the morphological characteristics of MPs, their adsorption capacity, and environmental conditions. Additionally, the desorption of heavy metals from MPs has implications for their bioavailability and poses risks to marine organisms, emphasizing the importance of source reduction and remedial measures. Hybrid approaches that combine both conventional and modern technologies show promise for the efficient removal of

Microplastics (MPs) and heavy metals are significant pollutants in the marine environment, necessitating effective remediation strategies to prevent their release into the sea through sewage and industrial effluent.

CHEMWATCH
Bulletin Board
Technical
NOV. 10, 2023

MPs and heavy metals from marine environments. This review identifies critical gaps in existing research that should be addressed in future studies including standardized sampling methods to ensure accurate data, further investigation into the specific interactions between MPs and metals, and the development of hybrid technologies at an industrial scale. Overall, this review sheds light on the adsorption and desorption mechanisms of heavy metal-enriched MPs, underscoring the necessity of implementing effective remediation strategies.

Authors: Punmoth Kalyadan Vrinda, Radhakrishnan Amal, Nandakumar Abhirami, Divya Alex Mini, Vattiringal Jayadradhan Rejish Kumar, Suja Purushothaman Devipriya

Full Source: Environmental science and pollution research international 2023 Nov 3. doi: 10.1007/s11356-023-30679-2.

Process modeling, environmental and economic sustainability of the valorization of whey and eucalyptus residues for resveratrol biosynthesis

2023-11-02

Biomass is one of the renewable resources with the greatest potential, not only because of the possibility of energy recovery but also because of its content in components of interest. In this context, the regions of Galicia and Portugal have large areas of land dedicated to forestry, agriculture and livestock, and the large amount of waste generated represents a cost for the producer. The importance of these facts has aroused great interest in society to focus its interest on improving the current situation while seeking a benefit, both environmental and economic, from existing resources. That is why the integration of biotechnological processes and biorefinery for their valorization are considered key aspects in the way of producing bioproducts and bioenergy. This research article proposes a process for producing resveratrol from whey from the dairy industry and eucalyptus residues from forestry exploitation. In order to evaluate its suitability, a techno-economic analysis and an environmental assessment have been carried out using the Life Cycle Assessment (LCA) methodology. The results obtained show the potential of these scenarios both from the economic point of view, by obtaining a minimum sale price of resveratrol to ensure the viability of the process below the market average, and from the environmental point of view, being eucalyptus residues those that result in a lower contribution to the environment per unit of resveratrol produced. Future research should focus on increasing the throughput of the production process to increase its profitability and on reducing energy requirements throughout the process, as these have been the main critical

Biomass is one of the renewable resources with the greatest potential, not only because of the possibility of energy recovery but also because of its content in components of interest.

points identified. In addition, following the sensitivity assessment, it has been concluded that opting for renewable energy is the most sustainable option.
Authors: Ana Arias, Carlos E Costa, Gumersindo Feijoo, Maria Teresa Moreira, Lucília Domingues
Full Source: Waste management (New York, N.Y.) 2023 Nov 2:172:226-234. doi: 10.1016/j.wasman.2023.10.030.

Adsorption and photocatalytic applications of porphyrin-based materials for environmental separation processes: A review

2023-11-03
As society progresses and industrializes, the issue of water pollution, caused by a wide array of organic and inorganic pollutants, poses significant risks to both human well-being and the environment. Given its distinctive characteristics, water pollution has become a paramount concern for society, necessitating immediate attention. Numerous studies have been conducted on wastewater treatment, primarily focusing on two key approaches: adsorption and photocatalytic degradation. Adsorption offers unparalleled advantages, including its simplicity, high removal efficiency, and cost-effectiveness. Conversely, photocatalysis harnesses abundant, clean, and non-polluting sunlight, addressing the critical issue of energy scarcity. Porphyrins, which are macrocyclic tetrapyrrole derivatives found widely in nature, have attracted growing interest in recent years. These lipophilic pigments exhibit remarkable chemical stability and have retained their major structural features for up to 1.1 billion years. As such, they are considered vital indicators of life and have been extensively studied, from the remnants of extinct organisms to gain insights into the principles of evolution. Porphyrins are often associated with a central metal ion within their ring system and can be modified through various substituents, including additional rings or ring opening, resulting in a wide range of functionalities. This comprehensive review summarizes recent advancements in the field of porphyrins. It begins by introducing the structures and preparation methods of porphyrins. Subsequently, it delves into notable applications of porphyrins in the context of pollutant adsorption in water and their environmentally friendly photocatalytic degradation.
Authors: Despina A Gkika, Kalliopi Ladomenou, Mohamed Bououdina, Athanasios C Mitropoulos, George Z Kyzas
Full Source: The Science of the total environment 2023 Nov 3:168293. doi: 10.1016/j.scitotenv.2023.168293.

As society progresses and industrializes, the issue of water pollution, caused by a wide array of organic and inorganic pollutants, poses significant risks to both human well-being and the environment.

CHEMWATCH
Bulletin Board
Technical
NOV. 10, 2023

PHARMACEUTICAL/TOXICOLOGY

Efficient treatment of actual glyphosate wastewater via non-radical Fenton-like oxidation

2023-10-31
Compared to radical oxidative pathway, recent research revealed that non-radical oxidative pathway has higher selectivity, higher adaptability and lower oxidant requirement. In this work, we have designed and synthesized Cu2O/Cu nanowires (CuNWs), by pyrolysis of copper chloride and urea, to selectively generate high-valent copper (CuIII) upon H2O2 activation for the efficient treatment of actual glyphosate wastewater. The detailed characterizations confirmed that CuNWs nanocomposite was comprised of Cu0 and Cu2O, which possessed a nanowire-shaped structure. The electron paramagnetic resonance (EPR) analysis, in situ Raman spectra, chronoamperometry and liner sweep voltammetry (LSV) verified CuIII, which mainly contributed to glyphosate degradation, was selectively generated from CuNWs/H2O2 system. In particular, CuI is mainly oxidized by H2O2 into CuIIIvia dual-electron transfer, rather than simultaneously releasing OH• via single electron transfer. More importantly, CuNWs/H2O2 system exhibited the excellent potential in the efficient treatment of actual glyphosate wastewater, with 96.6% degradation efficiency and chemical oxygen demand (COD) dropped by 30%. This novel knowledge gained in the work helps to apply CuNWs into heterogeneous Fenton-like reaction for environmental remediation and gives new insights into non-radical pathway in H2O2 activation.
Authors: Lei Jin, Yingping Huang, Honglin Liu, Liqun Ye, Xiang Liu, Di Huang
Full Source: Journal of hazardous materials 2023 Oct 31:463:132904. doi: 10.1016/j.jhazmat.2023.132904.

Compared to radical oxidative pathway, recent research revealed that non-radical oxidative pathway has higher selectivity, higher adaptability and lower oxidant requirement.

Application of life cycle assessment to high-soil conditioner production from biowaste

2023-11-02
The recent large-scale urbanization and industrialization resulted in an impressive growth of solid waste generation worldwide. Organic fraction generally constitutes a large fraction of municipal solid waste and its peculiar chemical properties open to various valorization strategies. On this purpose, life cycle assessment is applied to an innovative industrial system that processes 18 kt/y of agricultural and livestock waste into a high-quality soil conditioner. The high-quality soil conditioner production

system consists of a series of processes, including anaerobic digestion and vermicomposting, allowing the generation of a peat-like material with high carbon content, porosity, and water-holding capacity. The presence of a photovoltaic plant and a cogeneration plant, fed with the biogas produced in the anaerobic digestion, makes the system entirely self-sufficient from the national grid and generating a surplus of electricity of 1177MWh/y. The high-quality soil conditioner showed better environmental performances in 15 out of 18 impact categories when compared to alternative scenarios. In particular, the high-quality soil conditioner and the related biowaste management resulted in a carbon saving of around 397 kg CO2 eq/ton compared with a scenario involving the employment of peat in place of the high-quality soil conditioner and a traditional biowaste management, and 165 kg CO2 eq/ton compared with a scenario where cogeneration is replaced by biomethane upgrading. This study demonstrates the possibility of using organic waste as an environmentally sustainable and renewable source for energy and carbon to soil conditioning.

Authors: Francesco Arfelli, Daniele Cespi, Luca Ciacci, Fabrizio Passarini
Full Source: Waste management (New York, N.Y.) 2023 Nov 2:172:216-225. doi: 10.1016/j.wasman.2023.10.033.

OCCUPATIONAL

Prenatal exposure to replacement flame retardants and organophosphate esters and childhood adverse respiratory outcomes

2023-11-02

Background: The association of prenatal exposure to organophosphate esters (OPEs) and replacement brominated flame retardants (RBFRs) with respiratory outcomes has not been previously investigated in humans, despite reports that these chemicals can cross the placenta and alter lung development as well as immune functions.

Methods: In a cohort of 342 pregnant women recruited between 2003 and 2006 in the greater Cincinnati, Ohio Metropolitan area, we measured indoor dust OPEs and RBFRs at 20 weeks of gestation and urinary OPEs at 16 and 26 weeks of gestation and at delivery. We performed generalized estimating equations and linear mixed models adjusting for covariates to determine the associations of prenatal OPEs and RBFRs exposures with adverse respiratory outcomes in childhood, reported every six months until age 5 years and with lung function at age 5 years. We used multiple

Background: The association of prenatal exposure to organophosphate esters (OPEs) and replacement brominated flame retardants (RBFRs) with respiratory outcomes has not been previously investigated in humans, despite reports that these chemicals can cross the placenta and alter lung development as well as immune functions.

.

CHEMWATCH
Bulletin Board
Technical
NOV. 10, 2023

informant modeling to examine time-specific associations between maternal urinary OPEs and the outcomes.

Results: Dust concentrations of triphenyl phosphate (TPHP) (RR: 1.40, 95% CI: 1.18-1.66), 2-ethylhexyl-2,3,4,5-tetrabromobenzoate (RR: 1.51, 95% CI: 1.23-1.85), and bis(2-ethylhexyl) tetrabromophthalate (RR: 1.57, 95% CI: 1.28-1.94) were associated with higher risk of wheezing during childhood. Dust TPHP concentrations were associated with higher risk of respiratory infections (RR: 1.43, 95% CI: 1.08-1.94), and dust tris-(2-chloroethyl) phosphate concentrations were associated with hay fever/allergies (RR: 1.11, 95% CI: 1.01-1.21). We also found that dust tris-(2-chloroethyl) phosphate loadings were associated with lower lung function. Urinary OPEs mainly at week 16 of gestation tended to be associated with adverse respiratory outcome, while bis(1-chloro-2-propyl) phosphate and diphenyl phosphate at delivery were associated with lower risk of hay fever/ allergies.

Conclusions: In-utero exposure to OPEs and RBFRs may be a risk factor for adverse respiratory outcomes in childhood, depending on the timing of exposure.

Authors: Angelico Mendy, Zana Percy, Joseph M Braun, Bruce Lanphear, Mark J La Guardia, Robert C Hale, Kimberly Yolton, Aimin Chen
Full Source: Environmental research 2023 Nov 2:117523. doi: 10.1016/j.envres.2023.117523.

Temporal changes of exposure to water on physic-chemical, stability, and transport characteristics of pyrogenic carbon colloids

2023-11-03

Understanding the effect of the aging process on the properties of pyrogenic carbon (PyC) is critical for predicting and evaluating its transport and fate. Water exposure is a common application scenario of PyC entering aquatic systems or flooded paddy fields, which might significantly affect the aging process. However, only some studies focused on the changes in PyC properties by water exposure treatment. In this study, the effect of water exposure on the mobility of PyC was investigated. Fresh PyC, PyC with 1.5 years and 3.5 years of water exposure were selected and named as CK, 1.5WA, and 3.5WA, respectively. Our results revealed that CK had the lowest intensity of surface functional groups (-OH, CO, and C-O-C) and the intensity of 3.5WA was higher than that of 1.5WA. There was no significant change in dissolved organic matter (DOM) content between fresh and aged PyC colloids. However, UV absorbance and its parameters (E2/E3, E4/E6, and SR) exhibited a

Understanding the effect of the aging process on the properties of pyrogenic carbon (PyC) is critical for predicting and evaluating its transport and fate.

comparable tendency to the abundance of functional groups (-OH, CO, and C-O-C). The fresh and aged PyC colloids showed high stability in Na+ and Ca2+ solutions at varying pH values (A/A0 > 85%), which was also observed in groundwater. The mobility of fresh and aged PyC colloids differed in Na+ (21.74%-57.19%), Ca2+ (14.30%-40.12%) solutions and groundwater (28.50%-44.24%), but exhibited similar order (3.5WA > 1.5WA > CK). The mechanism of the effect of water exposure on the property and mobility of PyC colloids was explored. This study provides the fundamental information to estimate PyC fate and transport after long-term water exposure.

Authors: Yingjie Yin, Yang Wang, Hongyu Si, Jianying Shang

Full Source: Environmental pollution (Barking, Essex : 1987) 2023 Nov 3:122834. doi: 10.1016/j.envpol.2023.122834.

Copyright Chemwatch 2023 ©