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2023-09-30
The typical filters that protect us from harmful components, such as toxic gases and particulate matter (PM), are made from petroleum-based materials, which need to be replaced with other environmentally friendly materials. Herein, we demonstrate a route to fabricate biodegradable and dual-functional filtration membranes that effectively remove PM and toxic gases. The membrane was integrated using two layers: (i) cellulose-based nanofibers for PM filtration and (ii) metal-organic framework (MOF)-coated cotton fabric for removal of toxic gases. Zeolitic imidazolate framework (ZIF-8) was grown from the surface of the cotton fabric by the treatment of cotton fabric with an organic precursor solution and subsequent immersion in an inorganic precursor solution. Cellulose acetate nanofibers (NFs) were deposited on the MOF-coated cotton fabric via electrospinning.

At the optimal thickness of the NF layer, the quality factor of 18.0 cm3/cm2/s, and pressure drop of 14.2 Pa. The membrane exhibits outstanding gas adsorption efficiencies (>99%) for H2S, formaldehyde, and NH3. The resulting membrane was highly biodegradable, with a weight loss of 62.5% after 45 days under standard test conditions. The proposed strategy should provide highly sustainable material platforms for practical multifunctional membranes in personal protective equipment.

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Toxicological effects of aqueous extract of Genipa americana L. leaves on adult zebrafish (Danio rerio): Chemical profile, histopathological effects and lack of genotoxicity

2023-10-13
Genipa americana is a native plant of Brazil with potential applications in folk medicine. Whereas most of the phytochemical and pharmacological studies on this plant have focused on its fruits, the crude extracts of its leaves contain chemical metabolites that may have toxicity to organisms, which have yet to be investigated. This study aimed to determine the main groups of secondary metabolites in the aqueous extract of the leaves of G. americana by phytochemistry and qualitative HPLC, and to evaluate the possible toxicological effects and histopathological changes caused by this extract in zebrafish (Danio rerio) adults, through micronucleus test, nuclear abnormalities and histopathological analyses of gills and liver. While three metabolites of high intensity (phenolic compounds, flavonoids and triterpenes) were found in the phytochemical evaluation, the HPLC showed results compatible with flavonoids and iridoids, all belonging to common classes for this species and the Rubiaceae family. The acute toxicity test did not induce mortality or genotoxicity in zebrafish, but after exposure for 96 h, it was possible to observe injuries to the fish gill tissue, such as lamellar fusion, vasodilation and telangiectasia; in the liver, necrosis was visualized at 40 mg/L, and at higher concentrations (80 and 100 mg/L) induced sinusoidal widening was identified. In conclusion, the results demonstrated the toxic potential of this plant for aquatic species.

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Selective oxidation of organic pollutants based on reactive oxygen species and the molecular structure: Degradation behavior and mechanism analysis

2023-10-04
The selective and rapid elimination of refractory organic pollutants from surface water is significant. However, the relationship of between reactive oxygen species (ROSs) and diversified pollutants molecular structures still needs to be further clarified. Here, we utilize polydopamine (PDA)-assisted coating strategy to prepare hollow 2D carbon nanosheet (ZPL-HCNS) and 2D Co3O4 nanosheet (ZPL-Co3O4) by thermolysis of PDA coated ZIF-L (ZIF-L@PDA) precursor under different gas atmosphere, which realizes the controlled generation of radicals and non-radicals. Organic pollutants including bisphenols, sulfonamides, quinolones, tetracyclines, and azo dyes are applied to assess the catalytic performance. Results show that dyes containing azo structure are more likely to be degraded by radical process, which is due to that the energy (ΔE) requirements to break the azo bond is higher than energy released from singlet oxygen to
This study investigates the absorption behavior of natural dyes on silk fabric: madder roots (red dye) and amaltas (brown dye). The dyes were extracted under optimized conditions in an acidic medium. Binary mixtures of these dyes in different proportions were employed to develop various shades. This research work has explored the impact of single as well as binary mixture of chemical mordants on the dyeing behavior of natural dyes on silk. Al (Alum), iron (Fe), and tannic acid (T.A.) were used as pre- and post-mordants. Different concentrations of the dye mixtures were used to achieve different shades. The absorption behavior of the binary mixture of natural dyes was assessed using a spectro photometer Colori-spectra SF600. The study found that the highest color strength was achieved when an acidic extract with a table salt concentration of 2 g/100 mL was applied to silk fabric at 65 °C for 55 min and subjected to microwave treatment for 6 min. The study revealed excellent results for the selected binary mixtures of chemical mordants, such as (Al + Fe), (Al + T.A.), and (Fe + T.A.), in comparison by employing single mordants such as (Al, Fe, and T.A.).

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Per- and polyfluoroalkyl substances (PFAS) are man-made chemicals known for their adverse effects on humans. Growing concern has risen regarding the reproductive toxicity of PFAS, but whether PFAS affect endometriosis remains to be explored. This hospital-based case-control study included 240 laparoscopically confirmed endometriosis cases and 334 normal controls in China from 2014 to 2018. Concentrations of thirty-three legacy and emerging PFAS were measured in the plasma samples. Associations between single PFAS and endometriosis were estimated by binary logistic regression. The elastic net regression (ENR) model was used to identify dominant PFAS related to endometriosis. The joint effect of the PFAS mixture on endometriosis was assessed by principal component analysis (PCA), Bayesian kernel machine regression (BKMR), and quantile-based g-computation (g-gcom). In the single-PFAS model, significant positive associations of PFOS [adjusted odds ratio (95% CI): 1.22 (1.00, 1.51)], total PFOS [1.19 (1.05, 1.34)] and two branched PFOS isomers [1.16 (1.09, 1.22) for 1m-PFOS; 1.18 (1.04, 1.34) for 6m-PFOS] with increased endometriosis odds were observed. Mixture models showed that the joint effect of PFAS mixture on endometriosis was significant [1.24 (1.05, 1.48)], mainly driven by 1m-PFOS. The PFOS isomers profile suggested a PFOS precursor biotransformation source of 1m-PFOS in our population. Our study suggests that branched isomers of PFOS may be associated with endometriosis.

Environmental and lifestyle exposures have a huge impact on cancer risk; nevertheless, the biological mechanisms underlying this association remain poorly understood.
An Endocrine Disrupting Chemical (EDC) is any compound that disrupts the function of the endocrine system in humans and is ubiquitous in the environment either as a result of natural events or through anthropogenic activities. The objective of the study was to generate shellfish consumption data in the adult coastal population in France to assess exposure to health risks, the effects of determinants on the frequency of consumption and usual intake, and shellfish food risk perception. Our study, named the CONSUMER study, was carried out using an online survey in 2016 and 2017 and included a food frequency questionnaire. After validation, 2,479 individual questionnaires were available for statistical analysis. Our findings provide estimates of shellfish consumption frequency, portion sizes, weekly intake in g/week and g/week/body weight that can be used for acute and chronic exposure calculations. For the acute risk, the 97.5th percentile of the portion size was found to be around 290 g for the adult coastal population. For chronic exposure, recreational shellfish harvesting activities were associated with higher weekly intakes. A non-negligible part of this subpopulation is not aware of food safety recommendations concerning harvesting areas. Results for shellfish harvester consumption in particular are consistent with other available data. Exposure calculations and safety recommendations should target shellfish harvesters.

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