

PFAS adsorption by β -CD-Cl was similar in magnitude to other adsorbents proposed in the literature. However, unlike many commonly proposed adsorbents, it offers the advantage of not containing fluorine. <https://www.mdpi.com/2305-6304/11/4/264>

INFLUENCE OF WATER CHEMISTRY AND OPERATING PARAMETERS ON PFOS/PFOA REMOVAL USING RGO-NZVI NANOHYBRID

Ali, M., U. Thapa, J. Antle E. Tanim, J. Aguilari, I. Bradley, D. Aga and N. Aich. Journal of Hazardous Materials 469:133912(2024)

This study evaluated how and to what extent different environmental and operational parameters, such as initial PFAS concentration, H₂O₂ dose, pH, ionic strength, and natural organic matter (NOM), influenced PFOS and PFOA removal using graphene and zero-valent-iron based- nanohybrid (rGO-nZVI NH). With an initial increase in PFAS concentration (from 0.4 to 30 ppm), pH (3 to 9), ionic strength (0 to 100 mM), and NOM (0 to 10 ppm), PFOS removal reduced by 20%, 30%, 2%, and 6%, respectively, while PFOA removal reduced by 54%, 76%, 11%, and 33% respectively. In contrast, PFOS and PFOA removal increased by 10% and 41%, respectively, with an increase in H₂O₂ (from 0 to 1 mM). Overall, the effect of changes in environmental and operational parameters was more pronounced for PFOA than PFOS. Mechanistically, •OH radical generation and availability showed a profound effect on PFOA removal. Another key removal factor was the electrostatic interaction between rGO-nZVI NH and deprotonated PFAS compounds. Results confirm that rGO-nZVI in the presence of H₂O₂ can degrade PFOS and PFOA to some extent by identifying important by-products such as acetate, formate, and fluoride.

RESULTS OF 2018-19 WATER-QUALITY AND HYDRAULIC CHARACTERIZATION OF AQUIFER INTERVALS USING PACKER TESTS AND PRELIMINARY GEOPHYSICAL-LOG CORRELATIONS FOR SELECTED BOREHOLES AT AND NEAR THE FORMER NAVAL AIR WARFARE CENTER WARMINSTER, BUCKS COUNTY, PENNSYLVANIA

Senior, L.A. and A.R. Fiore. U.S. Geological Survey in cooperation with the U.S. Navy, Open-File Report 2024-1007, 156 pp, 2024

USGS collected data on the vertical distribution of hydraulic head, specific capacity, and water quality using aquifer-interval-isolation tests and other vertical profiling methods in 15 boreholes completed in fractured sedimentary bedrock in Northampton, Warminster, and Warwick Townships, Bucks County, Pennsylvania from 2018-19. The work was conducted to support detailed investigations at and near the former Naval Air Warfare Center (NAWC) Warminster, where PFOS and PFOA were measured in groundwater samples from supply and monitoring wells at concentrations above EPA health advisory levels for drinking water. The vertical distribution of aquifer properties and water quality was assessed through hydraulic tests and sampling of aquifer intervals using a straddle-packer system (13 boreholes) or depth-discrete point sampling under known borehole-flow conditions (2 boreholes). Geophysical and video logs were used to identify potential water-bearing fractures in 15 boreholes, ranging in depth from 210 to 604 ft, including six boreholes and nine existing wells on or near the site. The hydrogeologic framework, in conjunction with the vertical distribution of hydraulic heads and water quality, may assist in evaluating the locations of various PFAS sources and potential migration pathways of PFAS in groundwater. <https://pubs.usgs.gov/of/2024/1007/ofc20241007.pdf>

REPEATED AQUEOUS FILM-FORMING FOAMS APPLICATIONS: IMPACTS ON POLYFLUOROALKYL SUBSTANCES RETENTION IN SATURATED SOIL

Wanek, T.A., J.A. Field, and K. Kostarelos. Environmental Science & Technology 58(3):1659-1668(2024)

Repeated AFFF applications, composed of 14 anionic and 23 zwitterionic PFAS, were conducted on a single one-dimensional saturated soil column to quantify PFAS retention. An electrofluorination-based (3M)Milspec AFFF above the mixture's critical micelle concentration (CMC) was at application strength (3%, v/v). Retention and retardation of PFAS mass increased with each successive AFFF addition, though PFAS concentration profiles for subsequent applications differed from the initial. A greater degree of mass retention and retardation correlated with longer PFAS carbon-fluorine chain length and charged-headgroup type and as a function of AFFF application number. Anionic PFAS were increasingly retained with each subsequent AFFF application, while zwitterionic PFAS exhibited an alternating pattern of sorption and desorption. Surfactant-surfactant adsorption and competition during repeat AFFF applications at concentrations above the CMC resulted in adsorbed PFAS from the first application, changing the nature of the soil surface with preferential sorption of anionic PFAS and release of zwitterionic PFAS due to competitive elution. An application of a polyparameter quantitative structure-property relationship developed to describe sorption of AFFF-derived PFAS to uncontaminated, saturated soil was attempted for experimental conditions. The model had been derived for data where AFFF is below the apparent CMC. Experimental conditions that included the presence of mixed micelles (aggregates consisting of different kinds of surfactants that exhibit characteristics and properties different from micelles composed of a single surfactant) resulted in overall PFAS mass retained by an average of 27.3% \pm 2.7% above the predicted values. The correlation was significantly improved by adding a "micelle parameter" to account for cases where the applied AFFF was above the apparent CMC. Results highlight the importance of interactions between the AFFF components that can only be investigated by employing complex PFAS mixtures at actual AFFF concentrations and application strength above their apparent CMC. In AFFF source zones, competitive desorption of PFAS may result in downgradient PFAS retention when desorbed PFAS becomes resorbed to uncontaminated soil.

ENHANCED BIOACCUMULATION AND TRANSFER OF MONOMETHYLMERCURY THROUGH PERIPHYTIC BIOFILMS IN BENTHIC FOOD WEBS OF A RIVER AFFECTED BY RUN-OF-RIVER DAMS

Leclerc, M., D.E. Ponton, F. Bilodeau, D. Planas, and M. Amyot. Environmental Science & Technology 57(49):20792-20801(2024)

A study investigated periphyton and benthic communities from different habitats of the St. Maurice River (Quebec, Canada) affected by two run-of-river (ROR) power plants and their effect on the bioaccumulation and biomagnification of monomethylmercury (MMHg). Proportion of total mercury as MMHg reached maximum values \sim 2.9 times higher in flooded sites compared to unflooded sites. Impoundment by ROR would, therefore, provide favorable environments for periphyton growth, which can produce and accumulate MMHg. Periphyton MMHg concentrations significantly explained concentrations in some benthic macroinvertebrates, reflecting a local transfer. The analyses of $\delta^{13}C$ and $\delta^{15}N$ signatures found that flooding, which created scattered lentic habitats, led to modifications in trophic structures by introducing new organic matter sources. The computed trophic magnification slopes did not show significant differences in the transfer efficiency of MMHg between sectors, while intercepts of flooded sectors were higher. Increased MMHg concentrations in flooded areas are likely due to the impoundment combined with watershed disturbances, and the creation of small habitats favorable to periphyton, which should be included in future predictive models.

General News

MODIFICATION OF ACTIVATED CARBON FOR ENHANCED TREATMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES: A FOCUSED REVIEW

Okorie, C.J., T. Ojeyemi, A. Egbemhenge, M.Q. Ali, E.C. Emenike, K.O. Iwuozor, and A.G. Adeniyi. Remediation 34(2):e21777(2024)

The latest advancements in modifying activated carbon (AC) to enhance PFAS adsorption are reviewed in this article. It explores chemical and physical modifications, including metal/metal oxide nanoparticle deposition, polymer-based coatings, surfactants, and advanced oxidation processes, offering insights into their mechanisms and effectiveness. Analysis of modified AC materials is valuable for developing efficient and sustainable strategies to address PFAS contamination in water sources.

GROUNDWATER Cr(VI) CONTAMINATION AND REMEDIATION: A REVIEW FROM 1999 TO 2022

Xu, H., H. Zhang, C. Qin, X. Li, D. Xu, and Y. Zhao. Chemosphere 360:142395(2024)

This article presents a review and bibliometric analysis of the literature on the interest area "Cr(VI) in groundwater" published in the Web of Science Core Collection from 1999 to 2022. It summarizes information on 203 Cr(VI)-contaminated groundwater sites worldwide and derives basic characteristics of the sources and concentrations of contamination. Of the 203 contaminated sites, 69% were due to human causes, and 56% had Cr(VI) concentrations ranging from 0-10 mg/L. At groundwater sites with high Cr(VI) contamination due to natural causes, 75% of the sites had Cr(VI) concentrations < 0.2 mg/L. A total of 936 papers on "Cr(VI) in groundwater" were retrieved for bibliometric analysis: interest in research on Cr(VI) in groundwater has grown rapidly in recent years, and 59% of the papers were published in the field of environmental sciences. A systematic review of the progress of studies on the Cr(VI) removal/remediation based on reduction, adsorption, and biological processes is presented. Of 666 papers on Cr(VI) removal/remediation, 512, 274, and 75 papers dealt with reduction, adsorption, and bioremediation, respectively. In addition, several studies demonstrated the potential applicability of natural attenuation to remediate Cr(VI)-contaminated groundwater.

CURRENT UNDERSTANDING ON THE TRANSFORMATION AND FATE OF PER- AND POLYFLUOROALKYL SUBSTANCES BEFORE, DURING, AND AFTER THERMAL TREATMENT OF BIOSOLIDS

Hakeem, I.G., P. Halder, S. Patel, E. Selezneva, N. Rathnayake, M.H. Marzbal, G. Veluswamy, A. Sharma, S. Kundu, A. Surapaneni, M. Megharaj, D.J. Batstone, and K. Shah. Chemical Engineering Journal 493:152537(2024)

The current knowledge on PFAS transformation, destruction, and final fate before, during, and after thermal treatment of biosolids is consolidated in this review, which covers lab, pilot scale, and industrial studies. PFAS degradation mechanisms during thermal treatment of biosolids may differ from the established pathways for pure PFAS salts, given that biosolids have a complex organic and inorganic matrix and typically have low PFAS concentrations. Among thermal treatment techniques, pyrolysis has received extensive investigations at different scales of operation. However, for all techniques, treatment temperatures and residence time need to be sufficiently optimized for designing realistic large-scale thermal systems relevant to biosolids' compositional peculiarities for PFAS destruction. <https://www.sciencedirect.com/science/article/pii/S1359634724001045>

IMPLEMENTATION OF IN SITU AEROBIC COMETABOLISM FOR GROUNDWATER TREATMENT: STATE OF THE KNOWLEDGE AND IMPORTANT FACTORS FOR FIELD OPERATION

Skinner, J., A.G. Delgado, M. Hyman, and M.-Y.J. Chu. Science of the Total Environment 925:171667(2024)

This paper reviews 14 well-documented field-scale aerobic cometabolic bioremediation studies and summarizes the underlying microbiological factors that may affect the performance observed in these field studies. The combination of microbiological and engineering principles gained from field testing leads to insights and recommendations on the planning, design, and operation of an in situ aerobic cometabolic treatment system. The article also presents several novel topics and future research directions that can potentially enhance technology development and foster success in implementing this technology for environmental restoration. <https://www.sciencedirect.com/science/article/pii/S0167636924001806>

A REVIEW OF SAMPLE COLLECTION AND ANALYTICAL METHODS FOR DETECTING PER- AND POLYFLUOROALKYL SUBSTANCES IN INDOOR AND OUTDOOR AIR

Wallace, M.A.G., M.G. Smetz, J.M. Mattila, H.K. Liberatore, S.R. Jackson, E.P. Shields, X. Xhani, E.Y. Li, J.H. Johansson. Chemosphere 358:142129(2024)

A literature review presents the last two decades of research characterizing PFAS in outdoor and indoor air, focusing on active and passive air sampling and analytical methods. The PFAS classes targeted and detected in air samples include fluorotelomer alcohols, perfluoroalkane sulfonamides, perfluoroalkane sulfonamide ethanols, perfluorinated carboxylic acids, and perfluorinated sulfonic acids. Although manufacturing of PFOS and PFOA has largely been phased out, these PFAS are often detected in air samples. Recent estimates indicate that thousands of PFAS are likely present in the air that are not currently monitored by air methods. Advances in air sampling methods are needed to fully characterize the atmospheric transport of PFAS.

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