MINERALIZATION OF A FULLY HALOGENATED ORGANIC COMPOUND BY PERSULFATE UNDER CONDITIONS RELEVANT TO IN SITU REDUCTION AND OXIDATION: REDUCTION OF HEXACHLOROETHANE BY ETHANOL ADDITION FOLLOWED BY OXIDATION
A two-phase process was employed to degrade halogenate and isolate a representative halogenated compound (i.e., hexachloroethane), using persulfate (S$_2$O$_8$2-) based ISCO. A relatively high ethanol concentration (1.8 M) was added in the first phase, along with a high pH (typically used for ISCO (i.e., pH 12)) to rapidly degrade hexachloroethane via carbon-centered radicals, produced by the reaction of ethanol and radicals formed during S$_2$O$_8$2- decomposition, reacted with carbon-halogen bonds. Unlike conventional ISCO treatment, hexachloroethane transformation and S$_2$O$_8$2- decomposition took place in a matter of days without external heating or base addition. The presence of ethanol increased the reaction rate by a factor of 2-5 compared to the reaction without ethanol. The second phase of the reaction was initiated after most of the ethanol had been depleted when thermolytic S$_2$O$_8$2- decomposition resulted in SO$_4$2- production, which complicated the partially dehalogenated transformation products.

CRITICAL ROLE OF SEMIQUNONES IN REDUCTIVE DEHALOGENATION
A study focused on the reductive dehalogenation of tetrachloroethylene (i.e., 1,1,1,2-tetrachloroethane) and 1,1,1-trichloroethane (i.e., trichloroethylene) in the presence of Fe(II) reducing agents. The degradation did not occur within the experimental period of 288 h. However, when Fe(II) was added, the degradation occurred within 72 h. These results suggest that critical roles for semiquinones, both in the reduction of oxygen to water and in the oxidation of certain anions, are still unknown.

FUNCTIONALIZED FERROCENES ENABLE SELECTIVE ELECTROSORPTION OF ARSENIC OXIDATIONS OVER PHOSPHATE—A DFT EXAMINATION OF THE EFFECTS OF SUBSTITUTIONAL MOIEITIES, PH, AND OXIDATION STATE
White, P. NAVFAC Remediation Innovative Technology Seminar, 59 slides, 2023
Using surface-area weighted average concentrations (SWACs) to optimize sediment and soil remedies—Newsworthy, T. Y. Paulson, M. Broad and C. McNulty. The Journal of Physical Chemistry A 127(7):7727-7738 (2023)
Ab initio calculations were used to examine the competitive binding of As(V), Ph(V), and As(III) to ferrocenyl functionalized ferrocene (FC) forming (Fe)(V)As(III) complexes with and without functional substituents (CH$_3$, NH$_2$, COOH, CHO, C$_2$H$_5$, NO$_2$, and Cl). The study aimed to understand factors that influence the selectivity of As(V) over Ph(V) and As(III) over Ph(V), with varying donor-acceptor character depending on the oxidation. Additionally, Fe and CH$_3$ functional groups were added to change the Fe-As bond, which was observed to increase the anion’s donor property for Fe(III) PFOA (Fe-PFOA) and Fe(II) Phosphate (Fe-P phosphate) interactions. The results on the arsenic-Fe(III) and Fe(II) phosphate interactions offer an outline for designing functionalized ferrocene derivatives that can provide a path for identifying other molecules and substituents for efficient metalloions adsorption design.

POTENTIAL IMPACT OF BACTERIA ON THE TRANSPORT OF PFAS IN POROUS MEDIA
A study focused on the transport and retention of PFAS. First, a critical review of prior studies was conducted to deliver detailed observed PFAS-bacteria interactions and summarize the mechanisms of PFAS sorption and retention by bacteria. Second, the study provided helpful information on the evaluation of the efficiency of sorption methods used to solve relevant bioventing equations. After investigating the various assumptions and methods from the literature, an improved foundational bioventing model was developed that characterizes gas flow in unsaturated zones accounting for interphase mass transfer and biodegradation, and incorporating soil properties through a porous media model. This approach could be used to assess the potential impact of bacteria on the transport of PFAS in porous media.

GENERAL NEWS
CONDUCTING CLIMATE VULNERABILITY ASSESSMENTS AT SUPERFUND SITES
The issue paper explains the three components of a CVA (exposure, sensitivity, and adaptive capacity) and details six steps in the CVA process implemented by EPA for Superfund sites. A CVA may be performed by federal or state authorities to evaluate how climate change conditions at a site so they may be factored into site decision-making, determine whether adaptation measures are necessary to improve remedy resilience, and ensure remedy protectiveness is maintained under future changes in climate. The purpose of the CVA process is to assess how climate change will affect conditions at a site, including future projections of exposure, sensitivity, and adaptive capacity. The CVA process results in a prioritization of sites based on climate change risk.

DEVELOPING A ROBUST BIOVVENTING MODEL
A comprehensive review evaluated and compared the advantages and disadvantages of various bioventing models regarding the prediction of bioventing performance. The models were classified into three categories: empirical models, mechanistic models, and hybrid models. The study aimed to provide a framework for selecting the most appropriate bioventing model for a specific site. The results indicated that both empirical and mechanistic models are useful for predicting the performance of bioventing systems, but hybrid models are more reliable and accurate. The study recommended the use of hybrid models for predicting the performance of bioventing systems.

PHOTOCATALYSIS FOR CHEMICAL-FREE PFOA DEGRADATION – WHAT WE KNOW AND WHERE WE GO FROM HERE?
https://www.mdpi.com/2297-8747/28/3/76
This article is open access of this issue paper. It describes the types of photocatalysts and mechanisms used for chemical-free PFOA degradation and discusses the potential applications of these technologies.

PHOTOCATALYSIS FOR CHEMICAL-FREE PFOA DEGRADATION – WHAT WE KNOW AND WHERE WE GO FROM HERE?
Bacillus subtilis grown under aerobic conditions at pH 7 (above the p$_{K_a}$ of the product hydroquinone) and $10$ mM concentrations (10 mM) were used, but the solutes had negligible effects when $S$-15 were added to the reaction mixture. The study aimed to determine the potential of using Bacillus subtilis as a biocatalyst for the degradation of PFOA. The results indicated that both Bacillus subtilis and $S$-15 were effective in the degradation of PFOA. The study recommended the use of Bacillus subtilis as a biocatalyst for the degradation of PFOA.

SPECIAL AND TEMPORAL TRENDS OF PERSISTENT ORGANIC POLLUTANTS ACROSS EUROPE AFTER 15 YEARS OF MONET PASSIVE AIR SAMPLING
After 15 years of passive air monitoring (2003-2018) by the Global Monitoring Plan of the Stockholm Convention on Persistent Organic Pollutants (POPs), sufficient data was produced to analyze long-term trends of 20 POPs at 32 sites in 27 European countries. As of January 1, 2019, the convention regulates $p,p'$-DDE, $p,p'$-DDT, $p,p'$-DDD, $o,p'$-DDT, and $p,p'$-DDE. After 15 years, with tabular annual increase (trend) from 2013-2019, the average increase was 0.3 (percent per year) for $p,p'$-DDE, 0.6 (percent per year) for $p,p'$-DDT, and 0.2 (percent per year) for $p,p'$-DDD. No statistically significant differences were observed in the trends or the concentrations of specific POPs at sites in Western Europe compared to sites in Central and Eastern Europe, which suggests relatively uniform compound-specific distribution and removal at the continental scale.

The Study Paper was developed to document lessons learned in conducting climate vulnerability assessments (CVAs) at sites on the National Priorities List. The goals of a CVA are to assess future changes in climate conditions at a site so they may be factored into site decision-making, determine whether adaptation measures are necessary to improve remedy resilience, and ensure remedy protectiveness is maintained under future changes in climate. The CVA process results in a prioritization of sites based on climate change risk. The Engineering Forum, developed this issue paper to document lessons learned in conducting climate vulnerability assessments (CVAs) at sites on the National Priorities List. The goals of a CVA are to assess future changes in climate conditions at a site so they may be factored into site decision-making, determine whether adaptation measures are necessary to improve remedy resilience, and ensure remedy protectiveness is maintained under future changes in climate. The CVA process results in a prioritization of sites based on climate change risk.

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