Technology Innovation News Survey

Entries for July 16-31, 2024

Market/Commercialization Information

R -- OFFICE OF RESEARCH AND DEVELOPMENT (ORD) RISK MANAGEMENT AND ECOLOGICAL EXPOSURE (PRESOL)

Environmental Protection Agency, Cincinnati Acquisition Division, Cincinnati, OH
Contract Opportunities on SAM.gov 68HERC24R0169, 2024

When this solicitation is released in mid-October, 2024, it will be competed as a total small business set-aside under NAICS code 541715. EPA's Office of Research and Development (has a requirement for research, technical, and analytical services encompassing all forms of chemical and biological contamination within ecosystems, drinking water, drinking water sources and ambient water, facilities, industrial and municipal sites, infrastructure systems and/or buildings. The research is designed to provide practical multimedia solutions to environmental issues generated by catastrophic or long-term situations, assess and predict exposures of humans and ecosystems to harmful environmental stressors, and provide the foundation for developing approaches to reduce exposures, and safeguard human health and the environment. The awardee will be required to provide these support services on-site. This contract is for use by all of ORD, but it is anticipated that the contract will be primarily utilized by Cincinnati offices of ORD. The Government anticipates award of a single award, indefinite delivery/indefinite quantity (ID/IQ) contract that will allow for the issuance of firm fixed price and time-and-material type task orders over an ordering period of 7 years with a maximum ordering ceiling of $75 million. There is no solicitation at this time. https://sam.gov/opp/cbf89b1379b5476b831911b6d636459d/view

A -- STRATEGIC ENVIRONMENTAL RESEARCH AND DEVELOPMENT PROGRAM (SERDP) - OPEN TOPICS BROAD AGENCY ANNOUNCEMENT (BAA) (PRESOL)

U.S. Army Corps of Engineers, Humphreys Engineer Center Support Activity, Alexandria, VA
Contract Opportunities on SAM.gov W912HQ24S0004, 2024

DoD's SERDP Office is interested in receiving white papers for research focusing on Environmental Restoration, Munitions Response, Resource Conservation and Resilience, and Weapons Systems and Platforms technologies. This notice constitutes a Broad Agency Announcement (BAA) under NAICS code 541715 as contemplated in Federal Acquisition Regulation (FAR) 6.102(d)(2). This announcement declares DoD SERDP's intent to competitively fund research and development for environmental research that addresses the topic areas set forth in the announcement. No request for proposals, solicitation, or other announcement of this opportunity will be made. It is the proposer's sole responsibility to ensure SERDP properly receives the white paper. Awards will take the form of contracts. Submission of white papers is not restricted to any particular entity. The Government will not pay for any costs associated with the preparation of white papers or travel to present oral presentations supporting full proposals. There is no commitment by SERDP to make any contract awards nor to be responsible for any cost incurred by the offeror before the contract award. It is expected that multiple awards will be made dependent on the quality of white papers received and availability of funds. To be eligible for consideration, readers wishing to respond to this announcement must submit a white paper in accordance with all instructions on the SERDP website. This solicitation will remain open for 1 from the publication date, or until replaced by a successor BAA, whichever comes first. No faxed or hard copy submissions will be accepted.
https://sam.gov/opp/9ce287509da8476ab7eb38653927c603/view

A -- ENVIRONMENTAL SECURITY TECHNOLOGY CERTIFICATION PROGRAM (ESTCP) - ENVIRONMENTAL TECHNOLOGY DEMONSTRATIONS - OPEN TOPICS BROAD AGENCY ANNOUNCEMENT (BAA) (PRESOL)

U.S. Army Corps of Engineers, Humphreys Engineer Center Support Activity, Alexandria, VA
Contract Opportunities on SAM.gov W912HQ24S0005, 2024

ESTCP is interested in receiving white papers for innovative technology demonstrations that address DoD environmental and installation energy requirements as candidates for funding. This notice constitutes a Broad Agency Announcement (BAA) under NAICS code 541715 as contemplated in Federal Acquisition Regulation (FAR) 6.102(d)(2). Readers should note that this is an announcement to declare ESTCP's intent to competitively fund demonstration projects as described in the Program Announcement on the ESTCP website. No request for proposals (RFP), solicitation, or other announcement of this opportunity will be made. It is the sole responsibility of the offerors to make certain the white paper is properly received by ESTCP. Awards will take the form of contracts. Submission of white papers is not restricted in any way to any particular entity. The Government will not pay for any costs associated with the preparation of white papers or travel to present oral presentations in support of full proposals. There is no commitment by ESTCP to make any contract awards, nor to be responsible for any cost incurred by the offeror before contract award is made. It is expected that multiple awards will result, depending on the quality of white papers received and availability of funds. To be eligible for consideration, parties wishing to respond to this announcement must submit a white paper in accordance with the instructions on the website. This solicitation will remain open for one (1) year from the date of publication, or until replaced by a successor BAA, whichever comes first. No faxed or hard copy submissions will be accepted.
https://sam.gov/opp/1e97041ad4c4439a848672347b0fd76/view

A -- ENVIRONMENTAL SECURITY TECHNOLOGY CERTIFICATION PROGRAM (ESTCP) - ENVIRONMENTAL TECHNOLOGY DEMONSTRATIONS BROAD AGENCY ANNOUNCEMENT (BAA) FOR AQUEOUS FILM-FORMING FOAM (AFFF) DESTRUCTION (PRESOL)

U.S. Army Corps of Engineers, Humphreys Engineer Center Support Activity, Alexandria, VA
Contract Opportunities on SAM.gov W912HQ24S0030, 2024

ESTCP is interested in receiving proposals for innovative technology demonstrations that address DoD environmental requirements as candidates for funding. This notice constitutes a Broad Agency Announcement (BAA) under NAICS code 541715 as contemplated in Federal Acquisition Regulation (FAR) 6.102(d)(2). This is an announcement to declare ESTCP's intent to competitively fund demonstration projects as described in the Program Announcement on the ESTCP website. No electronic mail, faxed, or hard copy proposals will be accepted. No request for proposal (RFP), solicitation, or other announcement of this opportunity will be made. It is the sole responsibility of the offerors to verify the proposal is properly received by ESTCP. Awards will take the form of contracts. Submission of proposals is not restricted in any way to any particular entity. The Government will not pay for any costs associated with the preparation of proposals. To be eligible for consideration, parties wishing to respond to this announcement must submit a proposal in accordance with the instructions on the website, no later than 2:00 P.M. ET on September 19, 2024. https://sam.gov/opp/265679fc53fe404e9f2988ebc05deeae/view

Cleanup News

REMEDIATION OF DNAPL IN COMPETENT MUDSTONE: CHALLENGES AND IMPORTANCE OF POST MONITORING TO EVALUATE PERFORMANCE

Srirangam, R., E. Magdar, and F. Lakhwala. I Battelle 2024 Chlorinated Conference, 2-6 June, Denver, CO, 20 slides, 2024

In situ remediation was evaluated to address source mass, mitigate indoor vapor intrusion issues and prevent the bedrock plume from migrating offsite at a former dry cleaning site in northern Virginia. A controlled jet injection approach was selected to deliver ISCR reagents to address chlorinated solvent impacts. The creation and connectivity of new fractures overcame the transport limitations inherent at the site due to its geology and enabled direct contact of the amendment with the source mass trapped in portions of the bedrock that would conventionally be inaccessible. Jet injection also allowed the solid regent to act as a proppant, ensuring the fractures didn't collapse and achieving the expected radius of influence. Multiple fracturing intervals were implemented to inject ISCR reagents in eight open locations in the hotspot with each interval separated vertically by at least 2 ft. Borehole geophysics was an integral component used to (a) refine the potential injection zones/intervals and (b) understand the fate and transport of ISCR reagents. Results from a comprehensive post-monitoring program (> 24 months) are presented, including a discussion of some key components essential for successful optimization of the remedial strategy: 1) the importance of fluid conductivity and temperature measurements in identifying the preferred zone of groundwater flow; 2) optimizing the jet injection approach in competent mudstone; 3) advantages in combining solid and liquid ISCR amendments for long-term reduction in source mass (> 90%); 4) tracking geochemical signature to verify distribution and demonstrate the performance of ISCR reagents; and 5) managing gas production post-ISCR at sites with shallow bedrock.
Slides: https://battellestaging.xcddev.com/index.cfm/article/view/ID/16448
Longer Abstract: https://xcdacademy.s3.amazonaws.com/battelle/2024_Chlorinated/A2_1505_325_Srirangam.pdf

LESSONS LEARNED FROM LARGE-SCALE BIOAUGMENTATION AT A REMOTE SITE

Dombrowski, P.M. I Battelle 2024 Chlorinated Conference, 2-6 June, Denver, CO, 21 slides, 2024

Enhanced reductive dechlorination (ERD) with bioaugmentation was selected to remediate TCE impacts to soil and groundwater from industrial activities at a former manufacturing facility. A total of 1,893 liters of *Dehalococcoides* (DHC) was applied across two plumes over 3.5 acres in less than three weeks. Additional challenges associated with the site included forested and sloping topography, the need for significant clearing, biological hazards, and potential unexploded ordnance. Planning for onsite storage for an early spring injection needed to consider the possibility of freezing and warm temperatures in the southeastern U.S. During subsurface injections, bulk quantities of anaerobic water were prepared and used to protect the bioaugmentation culture. Deoxygenated water and electron donor solution were prepared simultaneously and applied as a protective "sandwich" surrounding each dose of anaerobic microbial culture injected. The project represented an especially aggressive bioremediation approach with respect to bioaugmentation dosage and injection schedule. Pre-injection TCE concentrations ranged from 2,000-20,000 ppb. Post-injection TCE concentrations were reduced to non-detect in all target treatment areas. Conversion to cis-1,2-DCE and VC was observed following initial injection and detected concentrations are trending downward after 10 months. DHC concentrations were also monitored from downgradient monitoring wells as another line of evidence for successful bioaugmentation. The presentation summarizes the numerous challenges in conducting a large bioaugmentation program, highlights the results to date and discusses how planning allowed the event to be conducted safely and successfully to aid other practitioners undertaking large bioaugmentation projects.
Slides: https://xcdacademy.s3.amazonaws.com/battelle/2024_Chlorinated/C2_1415_545_Dombrowski.pdf
Longer Abstract: https://battellestaging.xcddev.com/index.cfm/article/view/ID/16467

SIGNIFICANT RETURN ON INVESTMENT ACHIEVED BY SUCCESSFULLY REMEDIATING A CHALLENGING CHLORINATED SOLVENT SITE

French, K. I Battelle 2024 Chlorinated Conference, 2-6 June, Denver, CO, 44 slides, 2024

PCE and its related degradation products were identified in soil, groundwater, and soil vapor at a geologically complex site in British Columbia at concentrations above regulatory standards both on and offsite beneath sensitive receptors. PCE concentrations in groundwater were >10% of solubility, indicative of potential DNAPL before remediation. Previous remedial activities included excavating 7,800 yd^3 of PCE-impacted upper till soil in the source area and installing a P&T system to prevent further offsite plume migration in the lower sand unit. A pilot-scale injection program using an activated carbon-based remedial amendment completed in the worst-case" area showed good amendment distribution in the subsurface across the targeted vertical injection interval. Three-month post-injection groundwater quality monitoring showed that PCE concentrations decreased from > 25,000 µg/L to 99.9% reduction. The presentation provides an overview of the chemical and geological characteristics of the site, the methodology of the novel remedial injection technique used, details on how project technical obstacles were overcome, and a comparison of pre- and post-remediation groundwater quality data.
Slides: https://xcdacademy.s3.amazonaws.com/battelle/2024_Chlorinated/H6_0850_225_French.pdf
Longer Abstract: https://battellestaging.xcddev.com/index.cfm/article/view/ID/16855

Demonstrations / Feasibility Studies

SUSTAINABLE LINDANE WASTE REMEDIATION: SURFACTANT-DRIVEN RESIDUAL DNAPL EXTRACTION AND OXIDATION IN A REAL LANDFILL (LIFE SURFING)

Fernandez, J., D. Lorenzo, J. Net, E. Cano, P. Saez, C. Herranz, C.M. Dominguez, S. Cotillas, and A. Santos. I Science of The Total Environment 934:173260(2024)

Surfactant Enhanced Aquifer Remediation (SEAR) and in situ chemical oxidation (S-ISCO) were employed in the LIFE SURFING Project to remediate an aquifer contaminated with DNAPL from nearby lindane production at the Bailin Landfill in Sabinanigo, Spain. The project overcame traditional extraction limitations and prevented groundwater contamination from reaching the river. Two SEAR interventions involved injecting 9.3 m^3 (SEAR-1) and 6 m^3 (SEAR-2) of aqueous solutions containing 20 g/L of the non-ionic surfactant E-Mulse 3®, with bromide (~150 mg/L) serving as a conservative tracer. In SEAR-1 and SEAR-2, 7.1 and 6.0 m^3 were extracted, respectively, 60-70% of the injected bromide and 30-40 % of the surfactant were recovered, confirming surfactant soil adsorption. About 130 kg of DNAPL were removed, with >90% mobilized and 10% solubilized. A surfactant-to-DNAPL recovery mass ratio of 2.6 was obtained, a successful value for a fractured aquifer. The S-ISCO phase entailed injecting 22 m^3 of a solution containing persulfate (40 g/L), E-Mulse 3 (4 g/L), and NaOH (8.75 g/L) in pulses over 48 h, oxidizing ~20 kg of DNAPL and ensuring low toxicity levels. Preceding the SEAR and S-ISCO trials, time was dedicated to detailed groundwater flow characterizations, including hydrological and tracer studies, which allowed the design of a barrier zone between 317 and 557 m from the test cell and the river, situated 900 m from the site. This zone, which integrated alkali dosing, aeration, vapor extraction, and oxidant injection, effectively prevented fluid escape. Neither surfactants nor contaminants were detected in river waters post-treatment. No residual phase in test cell wells and reduced chlorinated compounds in groundwater were detected until one year after S-ISCO.

ISTR PILOT TESTING FOR IMPROVEMENT OF FULL-SCALE DESIGN: HOW TO DEAL WITH SURPRISES AND IMPROVE DESIGN

Heron, G., R. Glass, C. Gambelli, M. Donati, and A. Corcagnani. | Battelle 2024 Chlorinated Conference, 2-6 June, Denver, CO, 18 slides, 2024

A pilot test using thermal conduction heating (TCH) was conducted at a landfill contaminated with volatile and semi-volatile compounds such as TCE, PCE, hexachloroethane and hexachlorobenzene, near Rome, Italy. The pilot area was isolated by installing a 14 m-deep sheet pile cell. The objectives were to heat the subsurface material to near 100°C, capture and treat the generated vapors, and sample soils before and after to show decreased VOC and SVOC concentrations. Sheet piles were installed to form a square pilot test area of 15 x15 m along with 39 borings with heaters to treat the 9 to 13 m target area. Seven extraction wells and four temperature monitoring borings were placed between the heaters. A TCH power delivery system capable of delivering 250 kW of power to the heaters was used. Vapors and liquids were conveyed to an onsite treatment system with cooling, condensation, phase separation and treatment of vapors and liquids using granular activated charcoal. Despite several treatment challenges, contaminant concentrations decreased substantially after the heating period. TCE decreased by > 99% to < 0.5 mg/kg, PCE decreased by 98.5%, hexachloroethane was completely removed, and hexachlorobenzene concentrations decreased by 31%. Pilot test observations will enhance and derive the full-scale design. A detailed characterization effort is being undertaken to ensure that the full-scale design is based on realistic data on geology, water levels, and contaminants present.
Slides: https://xcdacademy.s3.amazonaws.com/battelle/2024_Chlorinated/C1_1300_428_Heron.pdf
Longer Abstract: https://battellestaging.xcddev.com/index.cfm/article/view/ID/16460

PILOT-SCALE FIELD STUDIES ON ACTIVATED MICROBIAL REMEDIATION OF PETROLEUM-CONTAMINATED SOIL

Sun, W.-J., Q. Li, B.-Y. Luo, R. Sun, C.-Y. Ke, S.-C. Wang, Q.-Z. Zhang, and X.-L. Zhang.
Environmental Geochemistry and Health 46:243(2024)

A field-scale study developed a simple, cost-effective microbial remediation process to treat petroleum-contaminated soil that involves adding microbial activators to stimulate indigenous petroleum-degrading microorganisms and enhancing the total petroleum hydrocarbons (TPH) degradation rate. The formulated microbial activator provided a growth-enhancing complex of nitrogen and phosphorus, trace elements, growth factors, biosurfactants, and soil pH regulators. The field trials involved two 500 m³ soil samples with an initial TPH content of 5.01% and 2.15% that were reduced to 0.41% and 0.02% in 50 days, respectively, reaching the national standard for cultivated land category II. The treatment period was notably shorter than the commonly used composting and bioaugmentation methods. After 40 days, the germination rate of rye seeds increased from 20 to 90%, indicating that the microbial activator could stimulate the functional microorganisms in the soil and reduce the phytotoxicity of the contaminated soil.

ENHANCING IN SITU REMEDIATION OF CLAYEY SOILS CONTAMINATED WITH TOTAL PETROLEUM HYDROCARBONS BY COMBINING PNEUMATIC FRACTURING, PLASMA BLASTING, AND VACUUM EXTRACTION: A COMPREHENSIVE FIELD INVESTIGATION

Jang, S.B., K.T. Wong, C.E. Choong, S. Hyun, Y. Yoon, E.H. Choi, N. Park, and M. Jang.
Journal of Environmental Chemical Engineering 12(3):113064(2024)

The potential combination of pneumatic fracturing, plasma discharge, and vacuum extraction (PPV) to enhance soil permeability and remediate field-scale silt/clayey TPH-contaminated soil was studied. Improved soil permeability was assessed by measuring chlorine and H_2O_2 concentrations in soil samples. The remediation efficiency of PPV was evaluated by analyzing the TPH concentrations in the soil samples. The initial highest TPH concentration was 6,922 mg/kg; after 42 days, the TPH levels decreased to 541 mg/kg. Overall, PPV demonstrated the ability to enhance oxidizing agent transfer by increasing soil permeability, suggesting its potential for efficient and targeted soil remediation.

Research

ONGOING LABORATORY PERFORMANCE STUDY ON CHEMICAL ANALYSIS OF HYDROPHOBIC AND HYDROPHILIC COMPOUNDS IN THREE AQUATIC PASSIVE SAMPLERS

Booij, K., S. Crum, B. Vrana, R. Grabic, N.A.O. Morin, K. Parmentier, C. Kech, P. Krystek, K. Noro, B. Becker, R. Lohmann, L. Malleret, S.L. Kaserzon, C. Miege, F. Alliot, F. Pfeiffer, D. Crowley, M. Rakowska, T. Ocelka, G.B. Kim, and L. Rohler.
Environmental Science & Technology 58(15):6772-6780(2024)

This study evaluated a proficiency testing program for the chemical analysis of hydrophobic organic compounds in silicone and low-density polyethylene (LDPE) passive samplers and hydrophilic compounds in polar organic chemical integrative samplers. The median between-lab coefficients of variation (CVs) of hydrophobic compound concentrations in the polymer phase were 33% (silicone) and 38% (LDPE), similar to the CVs obtained in four earlier rounds of this program. The median CV over all rounds was 32%. Much higher variabilities were observed for hydrophilic compound concentrations in the sorbent: 50% for the untransformed data and a factor of 1.6 after log transformation. Limiting the data to the best performing labs did not result in less variability. Data quality for hydrophilic compounds was only weakly related to the use of structurally identical internal standards and was unrelated to the choice of extraction solvent and extraction time. Standard deviations of the aqueous concentration estimates for hydrophobic compound sampling by the best performing labs were 0.21 log units for silicone and 0.27 log units for LDPE (factors of 1.6 to 1.9).

BIOREMEDIATION OF CHLORATE AND CHROMIUM CONTAMINATION WITH NATIVE MICROBIAL CULTURE IN COLD CLIMATE

Motevasselin, M., B. Gorczyca, I. Kalinovich, and R. Sparling.
Groundwater Monitoring & Remediation 44(1):46-56(2024)

A study aimed to determine if native microorganisms collected from a site contaminated with chlorate and chromate can lower concentrations in groundwater to acceptable regulatory levels. Anaerobic microcosm experiments were conducted with synthetic groundwater, native microorganisms, acetate as an electron donor, nitrogen, phosphorus, and minerals. The microorganisms utilized 2,200 mg/L acetate to remove 1,000 mg/L of chlorate and 3 mg/L of hexavalent chromium from the media, provided that the groundwater is supplemented with additional nitrogen and phosphorous (C:N:P molar ratio of 100:10:5). The added trace minerals solution prepared based on American Type Culture Collection 1191 medium did not improve the remediation process. Native microbial culture derived from the site removed the chlorate and chromate from the synthetic groundwater at 20°C in ~ 40 days; the same removal was achieved at 10°C in 80 days. This work confirmed the importance of sufficient N and P to stimulate chlorate- and chromate-reducing bacteria in groundwater.
https://ngwa.onlinelibrary.wiley.com/doi/epdf/10.1111/gwmr.12610

PARTITIONING OF PER- AND POLYFLUOROALKYL SUBSTANCES TO WEATHERED LIGHT NON-AQUEOUS PHASE LIQUID

Fang, Y., S. Fiorenza, C. Schaefer, K. Molloy, and C. Gurr.
Groundwater Monitoring & Remediation 44(1):122-126(2024)

This study investigated the partitioning of six PFAS between water and a weathered diesel and gasoline range hydrocarbon LNAPL collected from the subsurface of a decommissioned refinery. Both the structural features of PFAS and the characteristics of LNAPL exhibited significant impacts on the magnitude of PFAS partitioned to the LNAPL. The LNAPL-water partition coefficients (K_l) of PFOA and PFOS to the weathered LNAPL measured were nearly or more than 10 times greater than K_l values calculated by others for partitioning to single-component, unweathered NAPLs, indicating that lab studies evaluating LNAPL-water partitioning studies using single component NAPLs can largely underestimate the K_l expected to be encountered at AFFF-contaminated sites. Interactions with LNAPL can be important controllers of PFAS fate and transport, and the K_l values estimated suggest that LNAPL could be a significant transport sink for PFAS in the field. Results suggest that PFAS partitioning to weathered LNAPL is an important process to consider when designing remedial strategies, particularly those incorporating monitored natural attenuation or natural source zone depletion.

ACETYLENE TUNES MICROBIAL GROWTH DURING AEROBIC COMETABOLISM OF TRICHLOROETHENE

Skinner, J.P., S. Palar, C. Allen, A. Raderstorf, P. Blake, A.M. Reyes, R.N. Berg, C. Muse, A. Robles, N. Hamdan, M.-Y. Chu, and A.G. Delgado
Environmental Science & Technology 58(14):6274-6283(2024)

A study evaluated the ability of acetylene, an oxygenase enzyme-specific inhibitor, to decrease biomass production while maintaining aerobic TCE cometabolism capacity upon acetylene removal. Propane-metabolizing cultures (pure and mixed) were first exposed to 5% acetylene (v/v) for 1, 2, 4, and 8 d. TCE aerobic cometabolic activity was then verified. Exposure to acetylene overall decreased biomass production and TCE degradation rates while retaining the TCE degradation capacity. In the mixed culture, exposure to acetylene for 1-8 d showed minimal effects on the composition and relative abundance of TCE cometabolizing bacterial taxa. TCE aerobic cometabolism and incubation conditions exerted more notable effects on microbial ecology than acetylene. Acetylene appears to be a viable approach to control biomass production that may lessen the likelihood of bioclogging during TCE cometabolism.

FIRST EVIDENCE OF THE BIOACCUMULATION AND TROPHIC TRANSFER OF TIRE ADDITIVES AND THEIR TRANSFORMATION PRODUCTS IN AN ESTUARINE FOOD WEB

Wei, L.-N., N.-N. Wu, R. Xu, S. Liu, H.-X. Li, L. Lin, R. Hou, X.-R. Xu, J.-L. Zhao, and G.-G. Ying. | Environmental Science & Technology 58(14):6370-6380(2024)

A study characterized the levels and compositions of 15 tire additive transformation products (TATPs) in the Pearl River Estuary, estimated their bioaccumulation and trophic transfer potential in 21 estuarine species, and identified priority contaminants. Observations indicated that TATPs were prevalent in the estuarine environment. Eight, six, seven, and 10 TATPs were first quantified in the shrimp, sea cucumber, snail, and fish samples, with total mean levels of 45, 56, 64, and 67 ng/g (ww), respectively. N,N′-Diphenyl-p-phenylenediamine (DPPD) and N,N′-bis(2-methylphenyl)-1,4-benzenediamine (DTPD) exhibited high bioaccumulation. Significant biodilution was only identified for benzothiazole, while DPPD and DTPD displayed biomagnification trends based on Monte Carlo simulations. Bioaccumulation and trophodynamic mechanisms of TATPs were explained by their chemical hydrophobicity, molecular mass, and metabolic rates. Based on a multicriteria scoring technique, DPPD, DTPD, and N-(1,3-dimethylbutyl)-N′-phenyl-p-phenylenediamine quinone (6PPD-Q) were characterized as priority contaminants. The study emphasizes the importance of biomonitoring, particularly for specific hydrophobic tire additives.

OXIDATIVE TRANSFORMATION OF NAFION-RELATED FLUORINATED ETHER SULFONATES: COMPARISON WITH LEGACY PFAS STRUCTURES AND OPPORTUNITIES OF ACIDIC PERSULFATE DIGESTION FOR PFAS PRECURSOR ANALYSIS

Liu, Z., B. Jin, D. Rao, M.J. Bentel, T. Liu, J. Gao, Y. Men, and J. Liu.
Environmental Science & Technology 58(14):6415-6424(2024)

A study explored the use of classic acidic persulfate digestion, which generates sulfate radicals ($SO_4^{-\bullet}$), to extend the capability of the TOP assay. It examined the oxidation of Nafion-related ether sulfonates that contain C-H or -COO, characterized the oxidation products, quantified the F atom balance, and compared the oxidation of legacy fluorotelomers using $SO_4^{-\bullet}$ versus $HO^{\bullet}$. The $SO_4^{-\bullet}$ oxidation greatly expanded the scope of oxidizable precursors. Transformation was initiated by decarboxylation, followed by various spontaneous steps, such as HF elimination and ester hydrolysis. The results suggest novel product distribution patterns depending on the functional group and oxidant dose. The general trends and strategies were also validated by analyzing a mixture of 100,000- or 10,000-fold diluted AFFF (containing various fluorotelomer surfactants and organics) and a spiked Nafion precursor. Therefore, (1) the combined use of $SO_4^{-\bullet}$ and $HO^{\bullet}$ oxidation, (2) the expanded list of standard chemicals, and (3) further elucidation of $SO_4^{-\bullet}$ oxidation mechanisms will provide more critical information to probe emerging PFAS contaminants.

General News

WORKFORCE DEVELOPMENT IN THE ENVIRONMENTAL REMEDIATION FIELD SEMINAR

Becker, D., V. Dickerson, M. de Lurdes Dinis, G. Kwong, G. McKinley, and E. Shreeve. | Pacific Northwest National Laboratory RemPlex seminar, 90 minutes, 2024

This presentation by the Center for the Remediation of Complex Sites (RemPlex) with the International Atomic Energy Agency's Network of Environmental Remediation and NORM Management addresses the challenge of access to a trained workforce for the implementation of technically sound, cost-effective, timely, and sustainable remediation projects. Panelists with direct experience as STEM education program managers, university-level educators, plus agency and industry leaders who are facing shortages of trained staff will discuss: establishing a pipeline of professional development from recruiting students through providing continuing education for the existing workforce; building multidisciplinary and diverse teams; and retaining the expertise and experience of senior practitioners through knowledge management.
https://www.pnnl.gov/projects/remplex/seminars/workforce-development-environmental-remediation-field

A NEW METHODOLOGY FOR HIGH SPATIOTEMPORAL RESOLUTION MEASUREMENTS OF AIR VOLATILE ORGANIC COMPOUNDS: FROM SAMPLING TO DATA

DECONVOLUTION

Yang, Y., J. Zhou, C. Xie, W. Tian, M. Xue, T. Han, K. Chen, Y. Zhang, Y. Liu, Y. Huang, H. Sun, C. Liu, and S.-M. Li. l Environmental Science & Technology 58(28):12488-12497(2024)

This study presents an innovative integrated methodology suitable for achieving semi-real-time high spatiotemporal resolution 3D VOC measurements from the ground surface to hundreds of meters above ground. The methodology integrates an active AirCore sampler, custom-designed for deployment from unmanned aerial vehicles (UAV), a proton-transfer-reaction mass spectrometry for sample analysis, and a data deconvolution algorithm for improved time resolution to measure multiple VOCs in air. Applying the deconvolution technique significantly improves the signal strength of data from PTR-MS analysis of AirCore samples and enhances their temporal resolution by 4 to 8 times to 4-11 s. A case study demonstrates that the methodology can achieve sample collection and analysis of VOCs within 45 min, resulting in >120-360 spatially resolved data points for each VOC measured and achieving a 20-55 m horizontal resolution at a UAV flight speed of 5 m/s and a vertical resolution of 5 m. The methodology presents new possibilities for acquiring 3D spatial distribution of VOC concentrations, effectively tackling the longstanding challenge of characterizing 3D VOC distribution in the lowest portion of the atmospheric boundary layer.

ENVIRONMENTAL INTERACTIONS AND REMEDIATION STRATEGIES FOR CO-OCCURRING POLLUTANTS IN SOIL

Zeng, S., Z. Dai, B. Ma, R.A. Dahlgren, and J. Xu. l Earth Critical Zone 1(1):100002(2024)

The current understanding of environmental interactions and remediation strategies for individual pollutants in soil are summarized in this review with a focus on how this information can be used to develop effective remediation strategies for co-occurring pollutants.
https://www.sciencedirect.com/science/article/pii/S2950476724000023/pdfft?md5=daf157ba32619c7be8b5c7746b522f0a&pid=1-s2.0-S2950476724000023-main.pdf

ELECTROKINETIC REMEDIATION: PAST EXPERIENCES AND FUTURE ROADMAP FOR SUSTAINABLE REMEDIATION OF METAL-CONTAMINATED SOILS

Taneja, S., O. Karaca, and A.K. Haritash.
Journal of Geochemical Exploration 259:107437(2024)

This study discusses design and operational considerations of Electrokinetic Remediation (EKR), including power, electrode, and electrolyte characteristics. It addresses the major limitations of EKR, innovative modifications of EKR operations to overcome the limitations, and EKR-integrated technologies. Optimizing regulating parameters ensures maximum efficiency towards contaminant removal at minimum treatment cost, thus highlighting the engineering aspect of electrokinetics at field-scale. The sustainability concerns arising from EKR and its possible alternative solutions are also discussed to provide useful information and prospects to researchers. *See the Introduction and Section Snippets at* https://www.sciencedirect.com/science/article/abs/pii/S0375674224000530.

REVIEW ON GROUNDWATER CIRCULATION WELLS (GCWS) FOR AQUIFER REMEDIATION: STATE OF THE ART, CHALLENGES, AND FUTURE PROSPECTS

Ciampi, P., C. Esposito, and M.P. Papini.
Groundwater for Sustainable Development 24:101068(2024)

This article provides a critical overview of groundwater circulation wells (GCWs). The analysis of pertinent literature identifies three main fields where recirculating wells are addressed: (1) mathematical models, (2) lab studies, and (3) field applications. Categorizing studies on GCWs within these areas highlights the main findings, contradictory results, technological limitations, implications, and opportunities for future research. The discussion of field applications emphasizes the flexibility of recirculation systems, the possibility of coupling with other remediation technologies and numerous reagents, the targeted flushing of contaminated areas, pollutant mobilization from low-permeability areas triggered by hydraulic manipulation, and the reduction in remediation time and water consumption over traditional systems such as pump-and-treat.
https://www.sciencedirect.com/science/article/pii/S2352801X23001698/pdfft?md5=db884d919c7a1f102328328520550cb9&pid=1-s2.0-S2352801X23001698-main.pdf

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