Technology Innovation News Survey

Entries for January 16-31, 2020

Market/Commercialization Information

115 FW FUEL TANK CLEAN-UP

Dept. of the Army, W7N8 USPFO Activity Wisconsin ANG 115, Madison, WI.
Contract Opportunities on Beta.Sam.gov, Solicitation W50S9F-20-Q-0003, 2020

This RFQ is a total small business set-aside under NAICS code 562910, size standard 750 employees. During an in-flight emergency, an F-16 aircraft attached to the 115th Fighter Wing jettisoned two wing fuel tanks. One of the wing tanks contained about 200 gallons of Jet-A fuel and burst upon impact on private property adjacent to the Volk Field Combat Readiness Training Center. The fuel tank debris was removed, but cleanup of fuel from the soil surrounding the impact site will require remediation and documentation in accordance with Wisconsin regulations and guidance. The land on which the incident occurred is a USDA-designated Grassland Reserve Program. There are no roads, and mobilization to the site requires access to land owned by multiple private citizens. Period of performance will be 12 months. This effort is a high-priority requirement in support of the National Guard. Quotes are due by 4:00 PM CT on March 18, 2020. https://beta.sam.gov/opp/7c9fd9d8d9db4d04a7e0a04d5f70fc1d/view

MUNITIONS RESPONSE ACTIONS AT VIEQUES, PUERTO RICO

Naval Facilities Engineering Command Atlantic, Norfolk, VA.
Contract Opportunities on Beta.Sam.gov, Solicitation N6247020R2004, 2020

NAVFAC Atlantic seeks to identify potential small business sources of any economic classification that have capacity, experience, and interest in competing for a contract for a cost-plus-award-fee IDIQ contract for munitions response actions in Vieques, Puerto Rico, and other sites. The NAICS code for this requirement is 562910 (Environmental Remediation Services), size standard 750 employees. A base period and four one-year options is contemplated, with total work estimated over the life of the contract at $95M. Projects are typically $10M or more. The general scope of work includes but is not limited to conducting investigations, removal actions, and remedial actions in environments both terrestrial (on or beneath the land surface) and aquatic (marsh areas, surf zones, intertidal areas, ocean, lakes, or other underwater areas. Interested sources should respond to all questions presented in the Sources Sought Capabilities Questionnaire provided as an attachment at beta.sam. Responses are due by 4:00 PM ET on March 26, 2020.
https://beta.sam.gov/opp/bf784c61ad93476db8222e0b6813e4a3/view

RESEARCH FOR INNOVATIVE EMISSION REDUCTION TECHNOLOGIES RELATED TO COAL COMBUSTION RESIDUALS

U.S. DOE, National Energy Technology Lab, Funding Opportunity DE-FOA-0002190, 2020

Research and development under this funding opportunity is intended to increase the beneficial use of coal combustion residuals (CCR) and advance their management, thereby reducing the volume of CCR needed to be disposed of in impoundments while protecting the environment and the health and safety of the public. Advanced concepts and technologies are needed to address a technology gap that currently limits economic achievement of these objectives. About six awards are anticipated out of estimated total program funding of $4M. The closing date for applications is April 6, 2020. https://www.grants.gov/web/grants/view-opportunity.html?oppId=324149 See additional information on FedConnect at https://www.fedconnect.net/FedConnect/?doc=DE-FOA-0002190&agency=DOE.

BRAC ENVIRONMENTAL CONSTRUCTION OPTIMIZATION SERVICES (BECOS) - NORCAL REGION

Air Force Installation & Mission Support Center, FA8903 772 ESS PK, JBSA Lackland, TX.
Contract Opportunities on Beta.Sam.gov, Solicitation FA8903-20-R-0014, 2020

This acquisition is a total small business set-aside under NAICS code 562910. Contractor shall provide all management, tools, supplies, equipment, and labor necessary to perform the Base Realignment and Closure (BRAC) Environmental Construction and Optimization Services (BECOS) requirements. The BECOS requirements are follow-on contracts to current BRAC environmental remediation activities at BRAC installations. Proposals are due by 1:00 PM CT on April 13, 2020.
https://beta.sam.gov/opp/99db1899a8774d198da8674b27940e48/view

OPTIMIZING NATURAL SYSTEMS FOR REMEDIATION: UTILIZING INNOVATIVE MATERIALS SCIENCE APPROACHES TO ENHANCE BIOREMEDIATION

DHHS, National Institutes of Health, Funding Opportunity RFA-ES-20-004, 2020

NIEHS invites qualified investigators from domestic institutions of higher education to submit an application for the Superfund Research Program R01 Individual Research Project grant program. This opportunity focuses on research that will advance bioremediation effectiveness through incorporation of advanced, novel materials techniques. Bioremediation has advanced from reliance upon culturing and biogeochemical processing to a technology-enabled field enhanced by high-throughput molecular approaches (e.g., omics and gene editing techniques). Concurrent advances in materials science approaches present an opportunity to integrate new approaches to further refine the mechanisms of bioremediation, optimize conditions to accelerate natural degradation and/or stabilization processes, and address current and emerging recalcitrant hazardous substances and complex mixtures. About 10 awards are anticipated out of estimated total program funding of $2.5M. The current closing date for applications is April 20, 2020.
https://www.grants.gov/web/grants/view-opportunity.html?oppId=324428

Cleanup News

FULL-SCALE APPLICATION OF ACTIVATED CARBON TO REDUCE POLLUTANT BIOAVAILABILITY IN A 5-ACRE LAKE

Patmont, E., M. Jalalizadeh, M. Bokare, T. Needham, J. Vance, R. Greene, J. Cargill, et al.
Journal of Environmental Engineering Vol. 146 No 5 [Published online Feb 2020 prior to print]

In November 2013, a 2-week full-scale remediation project was conducted that directly placed ~36 tons of SediMite™ activated carbon (AC) into sediments on Mirror Lake in Dover, Delaware. The remedy aimed to enhance the sorption capacity of native sediments to reduce the exposure of bioaccumulative pollutants, including PCBs, contributing to fish consumption advisories. Post-treatment sampling indicated an average AC concentration of 4.3% by dry weight in surface sediments. Primary monitoring was performed pre- and 1 and 3 years post-remediation. Sediment porewater and surface water measurement using passive samplers showed reductions of 60%-80% of total freely dissolved PCBs. Fish tissue analysis of resident fish samples collected before and 3-5 years after treatment showed reductions of ~70% on a lipid-normalized basis and agree with modeled predictions. In contrast, two migratory species caught in the lake showed limited changes in PCB concentrations, likely reflecting greater regional exposure while these fish migrated beyond the lake.
More information: http://www.sestcp.com/case_studies08.html.

SURFACTANT FLOODING MAKES A COMEBACK: RESULTS OF A FULL-SCALE, FIELD IMPLEMENTATION TO RECOVER MOBILIZED NAPL

Sharma, P., K. Kostarelosa, S. Lenschow, A. Christensen, and P.C. de Blanc.
Journal of Contaminant Hydrology [Published online 14 January 2020 prior to print]

A micellar flood process was designed and implemented for full-scale remediation to mobilize and recover LNAPL from a surficial sandy

aquifer at a tank facility in western Jutland, Denmark. Phase behavior and flow experiments were conducted on field samples to identify suitable surfactant formulations. A field-scale simulation model indicated that a line-drive pattern with hydraulic control wells was optimal for NAPL recovery. In addition to monitoring during the field implementation, monitoring was conducted immediately after and for a period of >1 year. The field implementation resulted in >90% recovery (~36,000 kg of LNAPL) based on a mass balance using laser-induced fluorescence and chemical soil analysis (total petroleum hydrocarbon [TPH] and benzene, toluene, ethylbenzene and xylenes [BTEX]) data. Post-surfactant flood site monitoring consisted of sampling water from multi-levels and from recovery wells. Groundwater samples were analyzed for TPH and BTEX. Pre-treatment and post-treatment mass discharge monitoring led to a relationship between mass discharge with the mass reduction in the source zone. The mass discharge Γ-model was successfully implemented for LNAPL remediation.

IN-SITU THERMAL REMEDIATION OF TRICHLOROETHYLENE DNAPL FROM GLACIALLY DEPOSITED CLAY-SILT DIAMICTON AND SUBSEQUENT REMEDIAL PERFORMANCE ASSESSMENT

Raetz, R.M. | Great Lakes Environmental Remediation & Redevelopment Conference, 16-18 October, Lansing, MI, 77 slides, 2019

A former metal plating facility contaminated 23,700 y^3 of glacial clay-till diamicton with DNAPL solvents in an onsite septic drain-field to a depth of 34 ft. An in situ electro-thermal dynamic stripping process (ET-DSPTM) that integrated with multi-phase extraction (MPE) and surface treatment was applied to reduce TCE concentrations, which ranged from 34,000-17,000,000 µg/kg in soil throughout impacted regions of the site. Thermal treatment resulted in removal of more than 1,500 gallons of TCE after 245 days of active operations. The ES-DSP technology applied 168 electrodes in 84 locations, integrated with 55 MPE wells uniformly spaced throughout the site. A vacuum of ~10 inches mercury was achieved at each MPE well throughout the operation to affect a vapor flow of >600 ft^3/min, while also integrated with groundwater recovery to produce 6 gal/min. DNAPL separation, carbon system steam regeneration and sacrificial vapor phase carbon polish was integrated with groundwater air stripping and liquid phase carbon treatment. Digital temperature monitoring sensors were vertically placed throughout the subsurface to assess TCE co-boiling temperatures of 70-100°C resulting from the ET-DSP process. Over 12 months, 1,648 gal NAPL was recovered for an estimated 84-94% NAPL reduction. The presentation includes remedial design, construction, operation, and post-remediation sampling results.
https://www.michigan.gov/documents/egle/egle-tou-GLERRCpresentation-In-SituThermalRemediationTCE-DNAPL-Raetz_670756_7.pdf

CHLORINATED SOLVENT REMEDIATION DESIGN USING A HIGH-DENSITY SITE CHARACTERIZATION APPROACH

Taylor, A., M. Quimby, M. Miller, and D. Guilfoil.
Great Lakes Environmental Remediation & Redevelopment Conference, 16-18 October, Lansing, MI, 36 slides, 2019

The 1140 Broadway site in Ann Arbor, Michigan is contaminated with PCE to depths of 40 feet below ground and, despite previous attempts, had not been successfully remediated due to environmental challenges. Recent development interest provided a catalyst to remediate the site using permeable reactive barriers (PRBs) with the goal of reducing ~80% of off-site PCE mitigation. PRB design was challenged by the lack of adequate site characterization data, the non-continuous and variable sediments in the soil profile, the presence of separated upper and lower saturated units, and a tight construction and site development schedule. High-density remedial design characterization was used to develop a quantitative conceptual site model and a contaminant mass-driven design for more effective remediation. The model revealed 4,125 lb of PCE within the soil of a 60-ft wide band, with concentrations of 4,640,000 ppb in soil and 137,000 ppb in groundwater at the source. A PRB was installed consisting of CAT 100™ (PRB1) upgradient of the building and BOS 100® (PRB2) downgradient at the site boundary. In addition, the source area was treated with CAT 100 and BOS 100, a bacteria suite, starch, and yeast. Post-injection groundwater sampling in July 2019 one month after injections found an average PCE reduction of 68% in the source and PRB1 and 87% in PRB2.
https://www.michigan.gov/documents/egle/egle-tou-GLERRCpresentation-CVOC-RemediationUsingHD-SME_670757_7.pdf

Demonstrations / Feasibility Studies

A COMPARISON OF TOOLS AND METHODS FOR ESTIMATING GROUNDWATER-SURFACE WATER EXCHANGE

Cremeans, M.M., J.F. Devlin, T.C. Osorno, U.S. McKnight, and P.L. Bjerg.
Groundwater Monitoring & Remediation 40(1):24-34(2019)

Four tools to measure discharge rates in a sandy streambed were compared at six locations spaced 3 m along a transect near the north bank of a stream in Denmark: mini-piezometers, streambed point velocity probes (SBPVPs), temperature profilers, and seepage meters. All identified a similar trend of low to high groundwater discharges moving westward along the transect. Differences between discharges estimated from Darcy calculations (using the mini-piezometers) and SBPVPs were not statistically different from zero at the 90% confidence level. Seepage meter estimates were consistently lower than those of the other two methods but compared more reasonably with the application of a correction factor. In contrast, discharges estimated from temperature profiling to a depth of 40 cm were about an order of magnitude less than those determined with the other methods, possibly due to interferences from horizontal hyporheic flow. Method-specific sources of bias were hypothesized to cause statistically different discharge estimations at the same location. Seepage meters and the SBPVP achieved the least variability in measuring flow across the groundwater-surface water interface. The accuracy of the seepage meter depended on a calibrated correction factor while that of the SBPVP did not.

FIELD DEMONSTRATION OF ENHANCED REMOVAL OF CHLORINATED SOLVENTS IN GROUNDWATER USING BIOCHAR-SUPPORTED NANOSCALE ZERO-VALENT IRON

Qian, L., Y. Chen, D. Ouyang, W. Zhang, L. Han, J. Yan, P. Kvapil, and M. Chen.
Science of the Total Environment 698:134215(2019)

Biochar-supported nanoscale zero-valent iron (biochar-nZVI) was successfully injected into groundwater at a site impacted by chlorinated solvents in the North China Plain. A two-step injection process was implemented using direct-push and water pressure-driven packer techniques to overcome the significant shortcomings of nZVI agglomeration for in situ groundwater remediation. The demonstration revealed a sharp chlorinated solvent concentration reduction in 24 h following the first injection of nZVI but concentrations rebounded within two weeks. Biochar-nZVI application greatly enhanced chlorinated solvent removal in groundwater over 42 days. Increases in ferrous iron and chloride concentrations after the injections indicated that the reduction has occurred during the removal of chlorinated solvents in groundwater.

FIELD-SCALE IMPLEMENTATION OF SULFIDATED NANO ZEROVALENT IRON FOR IN-SITU REMEDIATION

Garcia, A.N., Ph.D. thesis, University of Western Ontario, 207 pp, 2019

Sulfidated nano zerovalent iron (S-nZVI) was synthesized onsite using sodium borohydride stabilized with carboxymethylcellulose and gravity fed into a non-native sandy material in a designated injection well to remediate cVOCs in groundwater. Multiple monitoring wells were installed up and downstream of the injection well to monitor particle breakthrough and changes in the aquifer system. Transport of S-nZVI to both downgradient and upgradient monitoring wells resulted in a significant shift in aqueous phase concentrations of cVOCs. cVOC dechlorination was confirmed with compound-specific isotope analysis, changes in concentrations of intermediate degradation products, and an increase of ethene concentrations. The field demonstration was followed by a bench-scale study on the aging characteristics and reactivity of S-nZVI. Results suggested that particles could remain operational after extended storage. Results indicated that sulfidation is a suitable amendment for the development of more efficient nZVI-based treatments for in situ remediation.
https://ir.lib.uwo.ca/cgi/viewcontent.cgi?article=8451&context=etd

ESTIMATING BIOAUGMENTATION EFFICACY OF TCE DECHLORINATION USING LONG-TERM FIELD WELL-TO-WELL TESTS IN A HIGHLY RECHARGED AND TCE-CONTAMINATED AQUIFER

Han, K., S. Park, U. Hong, Y. Yeum, S. Kwon and Y. Kim.
Journal of Environmental Science and Health, Part A 54(3): 208-218(2019)

A combined field method accurately assessed the extent of TCE reductive dechlorination activity and mass fraction of its byproducts was demonstrated. Soil column and field bioaugmentation tests were conducted to evaluate the method, which combined injecting a known concentration of 1,1,2-trichloro-2-fluoroethene (TCFE) as a TCE bio-surrogate and a forced mass balance (FMB) data processing technique that considers the sorption effect on the mass fraction of chloroethene. In the soil column test, the FMB resulted in a mass fraction of 6% TCE, 48.3% cis-1,2-dichloroethene, 18.5% vinyl chloride, and 27.2% ethylene. In the field bioaugmentation test, TCFE showed equivalent dechlorination pathways of TCE. The mass fractions estimated by FMB were very similar to those observed in the soil column bioaugmentation tests: 4.5% TCFE, 57.1% 1,2-dichloro-1-fluoroethene, 12% 1-chloro-1-fluoroethene and 26.4% fluoroethene. The FMB method gave ~50% higher mass fraction for more chlorinated ethenes and ~10% lower mass fraction of less chlorinated ethenes than those considering only the aqueous concentrations of chlorofluoroethenes.

Research

ASSESSMENT OF BIODEGRADATION IN NATURAL ATTENUATION PROCESS OF CHLORINATED HYDROCARBONS CONTAMINATED SITE: AN ANAEROBIC MICROCOSM STUDY

Zhang, X., X. Zhu, R. Chen, S. Deng, R. Yu, and T. Long.
Soil and Sediment Contamination: An International Journal 29(2):165-179(2019)

In situ anaerobic microcosm systems were constructed using chlorinated hydrocarbon (CHC)-contaminated soil and groundwater collected from a former pesticide manufacturing site to evaluate natural attenuation potential and its relationships with the geochemistry conditions and microbial communities. Redox conditions measured in both soil and groundwater favored CHC biodegradation processes. Biodegradation was confirmed by comparing PCE and 1,2-DCA degradations along with Cl- accumulation rates between the unsterilized microcosms and the sterilized controls. Using 16S rRNA and Shannon-Winner index analysis revealed distinct shifts of microbial community compositions in the soil and the groundwater microcosm systems during incubation. The dominant species mainly associated with phylum *Proteobacteria*, *Firmicutes*, and *Actinobacteria*. *Geobacter*-, *Streptomyces*-, and *Acetoanaerobium*-associated gene sequences confirmed the in situ biological dechlorination potentials of CHCs. The study showed that an in situ natural attenuation approach was a suitable remediation technique for the CHC-contaminated site.

EXPERIMENTAL STUDY ON REMOVING HEAVY METALS FROM THE MUNICIPAL SOLID WASTE INCINERATION FLY ASH WITH THE MODIFIED ELECTROKINETIC REMEDIATION DEVICE

Ji, H., W. Huang, Z. Xing, J. Zuo, Z. Wang, and K. Yang. | Scientific Reports 9:8271(2019)

A modified electrokinetic remediation cylinder device was used to remove heavy metal pollutants from municipal solid waste incineration fly ash. Instead of using a traditional 1:1 volume ratio of the cathode chamber to the anode chamber, this study used a volume ratio of 16:1. Changes in parameters, such as pH and conductivity in the cathode and the anode chambers as well as current and voltage in the sample area were analyzed under a voltage gradient of 2 V/cm. Average removal efficiencies for Zn, Pb, Cd, and Cu in the sample area were 53.2%, 31.4%, 42.3%, and 30.7%, respectively. https://www.nature.com/articles/s41598-019-43844-w.pdf

DETECTION OF ORGANOHALIDE-RESPIRING ENZYME BIOMARKERS AT A BIOAUGMENTED TCE-CONTAMINATED FIELD SITE

Heavner, G.L.W., C.B. Mansfeldt, M.J. Wilkins, C.D. Nicora, G.E. Debs, E.A. Edwards, et al.
Frontiers in Microbiology 10:1433(2019)

Shotgun proteomics were applied to groundwater samples from a well-characterized, TCE-contaminated industrial site in southern Ontario that was bioaugmented with KB-1™ to measure biomarkers and enzymatic proteins. The relative abundances of specific enzymatic proteins were subsequently compared to corresponding qPCR-derived levels of DNA and RNA biomarkers in the same samples. Samples were obtained from two wells with high hydraulic connectivity to KB-1 and two control wells that showed evidence of low levels of native *Dehalococcoides* and *Geobacter*. Enzymes involved in organohalide respiration were detected in the metaproteomes of all four field samples, as were chaperonins of *Dehalococcoides mccartyi*, chemotaxis proteins, and ATPases. VcrA was the most highly expressed RDase gene in the bioaugmentation culture and bioaugmented groundwater samples. High expression of the *Geobacter* pceA RDase was found in one background groundwater well. DNA and RNA biomarkers detected using qPCR-based assays were a set of orthologs of *Dehalococcoides* reductive dehalogenases, and the Ni-Fe uptake hydrogenase, HupL. Within a sample, RNA levels for key enzymes correlated with relative protein abundance. Results indicated that RNA and protein biomarker monitoring is a promising technique to monitor the activity of in situ populations of organohalide-respiring bacteria. *This article is* ***Open Access*** *at*https://www.frontiersin.org/articles/10.3389/fmicb.2019.01433/full?report=reader

ASSESSING CONTINUED ELECTROCHEMICAL TREATMENT OF GROUNDWATER IMPACTED BY AQUEOUS FILM-FORMING FOAMS

Schaefer, C.E., C. Andaya, A. Maizel, and C.P. Higgins.
Journal of Environmental Engineering Vol. 145 No. 12 (2019)

A 21-day study tested an electrochemical treatment using boron-doped diamond anodes on groundwater impacted with aqueous film-forming foam (AFFF) in successive 24-hour batch cycles. Results showed defluorination of both PFAAs and polyfluoroalkyl compounds. Substantial perchlorate generation was observed throughout the study. PFAS treatment effectiveness diminished over time due to scaling, resulting in decreased removal of the PFAAs and generation of PFBA. Based on measured generation of fluoride relative to the concentrations of the PFAAs, defluorination of the polyfluoroalkyl acids decreased 2-3 times more than the PFAAs due to this scaling, suggesting that defluorination of the polyfluoroalkyl acids occurred via a mechanism different from that of the PFAAs. Acid cleaning to remove the accumulated scale resulted in the restoration of PFAS treatment. Polyfluorinated compounds and PFBA showed greater adverse impacts from the mass transfer and/or residence time decreases associated with the scaling than what was observed for the other PFAAs. This implies that these compounds may prove to be a greater challenge in long-term full-scale applications.

REMEDIATION OF HEXAVALENT CHROMIUM CONTAMINATED WATER THROUGH ZERO-VALENT IRON NANOPARTICLES AND EFFECTS ON TOMATO PLANT GROWTH PERFORMANCE

Brasili, E., I. Bavasso, V. Petruccelli, G. Vilardi, A. Valletta, C. Dal Bosco, A. Gentili, et al.
Scientific Reports 10:1920(2020)

This study evaluated Cr(VI) removal using zero-valent iron nanoparticles (nZVI) and the impact of Cr(VI), nZVI, and an nZVI/Cr(VI) combined treatment on tomato growth. To evaluate the Cr(VI) toxic effect on germination capability, seeds were exposed to increasing Cr(VI) concentrations up to 1000 mg/L. The inhibition of seed germination and the decrease of hypocotyl and root length began at a Cr(VI) concentration of 5 mg/L. Under treatment with Cr(VI) + nZVI 5 mg/L, seed germination, hypocotyl and root length were significantly higher compared to Cr(VI) 5 mg/L treatment. The impact of only nZVI was investigated on chlorophyll and carotenoid in leaves; iron levels in leaves, roots, fruits and soil; carotenoid, fat-soluble vitamin and nicotianamine in mature fruits. A significant increase of leaf chlorophyll and carotenoids was observed after nZVI 5 mg/L treatment compared to controls. No significant variations were observed in carotenoids, fat-soluble vitamins, and nicotianamine levels after treatment with nZVI 5 mg/L in mature fruits.
https://www.nature.com/articles/s41598-020-58639-7.pdf

REMOVAL OF OXYANION FORMING ELEMENTS FROM CONTAMINATED SOILS THROUGH COMBINED SORPTION ONTO ZERO-VALENT IRON (ZVI) AND MAGNETIC SEPARATION: ARSENIC AND CHROMIUM AS CASE STUDIES

Zhou, Z., Q. Alhadidi, K.Q. Deliz, H.Y. Greenslet, and J.-C. Bonzongo.
Soil and Sediment Contamination: An International Journal 29(2):180-191(2019)

Lab experiments were conducted to remediate soils contaminated with either As or Cr using zero-valent iron (ZVI) particles and magnetic

separation techniques. In addition to total concentrations, the association of As and Cr with the different geochemical fractions in soils was determined before and after treatment by chemical sequential extraction. Results showed that >73% of initial total As and >92% of Cr were transferred from contaminated soils to ZVI particles. The particles were retrieved by magnetic separation with a ZVI recovery efficiency of 99%. Soil pH had a significant role in controlling As and Cr sorption onto ZVI particles. ZVI application rates (2.5% and 5%) affected the removal of Cr, but not of As. Using abandoned cattle dipping soils, with an initial arsenic concentration of 24.1 mg/kg, treatment with ZVI and magnetic separation decreased the initial concentration by 60.58%. In addition to reducing metal pollution in soil and potentially eliminating phytotoxicity, this combination of metal sorption onto ZVI and retrieval by magnetic separation could also help shift away from the current definition of remediation to a new paradigm, which would focus on the recovery of metal resources.

STABILIZATION OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFASS) WITH COLLOIDAL ACTIVATED CARBON (PLUMESTOP®) AS A FUNCTION OF SOIL CLAY AND ORGANIC MATTER CONTENT

Sorengard, M., D.B. Kleja, and L. Ahrens.
Journal of Environmental Management 249:109345(2019)

PlumeStop was systematically assessed for its ability to stabilize PFAS in soil in 10 soil mixtures with gradually increasing organic carbon and clay fractions. The mixtures were spiked with 18 different PFASs of varying perfluorocarbon chain lengths and four different functional groups and were aged for one year. Equilibrium leaching tests showed that colloidal activated carbon's (AC's) ability to increase PFAS sorption to soil depended on perfluorocarbon chain length. The best treatment efficiency was observed for chain lengths 6-7 where colloidal AC resulted in sorption of 81%, 85%, and 86% for PFOA, FTSA, and PFHxS, respectively. Sorption of individual PFASs decreased significantly with increasing organic carbon content in soil treated with colloidal AC indicating stearic hindrance of the AC pore structure. Sorption of the majority of PFASs increased significantly ($p<0.05$) with increasing clay content in colloidal AC-treated soil, likely due to the increase in surface area that colloidal AC can sorb to. Results indicate that the colloidal AC product tested can be useful in remediation approaches for certain PFASs under specific field conditions and PFAS contamination.

General News

IMPLEMENTING ADVANCED SITE CHARACTERIZATION TOOLS

The Interstate Technology & Regulatory Council Implementing Advanced Site Characterization Tools Team, Report No. ASCT-1, 328 pp, 2019

This document helps state regulators and other practitioners understand, evaluate, and select advanced sited characterization tools (ASCTs) to develop and refine site conceptual site models. It describes site characterization tools that can quickly deliver semi-quantitative or qualitative data to identify locations and depths where quantitative data should be collected and aid in visualizing and understanding the physical and environmental characteristics of a site. ASCTs in this document are divided into four general categories: direct sensing tools, downhole geophysical tools, surface geophysical tools, and remote sensing tools. An interactive ASCTs Selection Tool helps identify appropriate tools and information for collecting geologic, hydrologic, and chemical data. Once one or more prospective tools have been identified, more detailed information about a tool can be obtained by reviewing the description of the tool in the web-based document and the Tool Summary Tables, Case Studies, and Checklists. This text was developed in two different formats: Web-based document: https://asct-1.itrcweb.org/ PDF file: https://asct-1.itrcweb.org/asct_full_pdf_12_15_19.pdf

OPTIMIZING INJECTION STRATEGIES AND IN SITU REMEDIATION PERFORMANCE

The Interstate Technology & Regulatory Council Optimizing Injection Strategies and In Situ Remediation Performance Team. Report No. OIS-ISRP-1, 180 pp, 202

This guidance describes how treatment ineffectiveness can be avoided through effective upfront characterization and design. It also provides the state of the practice based on firsthand knowledge and experiences for a broad audience, including environmental consultants, responsible parties, federal and state regulators, and community and tribal stakeholders. The document is divided into sections including remedial design characterization; amendment, dose, and delivery design; implementation and feedback optimization, regulatory perspectives, community and tribal stakeholder considerations, and case studies. This text was developed in two different formats: Web-based document: https://ois-isrp-1.itrcweb.org/ PDF file: https://ois-isrp-1.itrcweb.org/ois-isrp-1_full_pdf_2_22_20.pdf

REMOVAL OF POLY- AND PERFLUOROALKYL SUBSTANCES (PFAS) FROM WATER BY ADSORPTION: ROLE OF PFAS CHAIN LENGTH, EFFECT OF ORGANIC MATTER AND CHALLENGES IN ADSORBENT REGENERATION

Gagliano, E., M. Sgroi, P.P.Falciglia, F.G.A.Vagliasindi, and P. Roccaro.
Water Research 171:115381(2020)

Recent studies on long- and short-chain PFAS removal by adsorption were examined to summarize the performance of different adsorbents for both long- and short-chain PFAS, the effect of organic matter, and adsorbent regeneration techniques. Findings indicated that strong anion-exchange resins seem to better remove both long- and short-chain PFAS, but the adsorption capacity of short-chain PFAS is lower and are thus more challenging to remove. The effect of organic matter on PFAS adsorption in water or wastewater under real environmental conditions is generally overlooked. The rapid breakthrough of PFAS is a limiting factor; regeneration of PFAS-exhausted adsorbents is very challenging and requires more research.

MOLECULAR GEL SORBENT MATERIALS FOR ENVIRONMENTAL REMEDIATION AND WASTEWATER TREATMENT

Lim, J.Y.C., S.S. Goh, S.S. Liow, K. Xue, and X.J. Loh.
Journal of Materials Chemistry A 7:18759-18791(2019)

This review highlights key advances of molecular gel development with an emphasis on hydrogels, polymers and composites, microorganisms and iron nanoparticles achieved during the last decade. Key design features of each gel material are emphasized in a "bottom-up" approach that accounts for the gels' target pollutant adsorption characteristics and material properties together with the most important practical considerations necessary for real-life usage.

DEVELOPMENT AND VALIDATION OF TECHNOLOGIES FOR REMEDIATION OF 1,2,3-TRICHLOROPROPANE IN GROUNDWATER

Merrill, J.P., E.J. Suchomel, S. Varadhan, M. Asher, L.Z. Kane, E.L. Hawley, and R.A. Deeb.
Current Pollution Reports 5:228-237(2019)

This review provides an overview of 1,2,3-trichloropropane, including use, physicochemical properties, fate and transport, health effects, and current regulation. The states of treatment technologies for TCP are detailed, including granular activated carbon, in situ chemical reduction (ISCR), in situ bioremediation (ISB), and chemical oxidation. Case studies and notable findings are described for ISCR and ISB. While knowledge gaps remain for ISCR and ISB, results to date for these technologies are encouraging.

ADSORPTION OF PERFLUOROALKYL AND POLYFLUOROALKYL SUBSTANCES (PFASS) FROM AQUEOUS SOLUTION - A REVIEW

Zhang, D.Q. W.L. Zhang and Y.N. Liang.
Science of The Total Environment 694:133606(2020)

This article reviews the technical feasibility of using different adsorbents, such as activated carbon, ion exchange resins, minerals, molecularly imprinted polymer, carbon nanotubes, and a wide range of potentially low-cost biosorbents, for PFASs removal from water or wastewater. It evaluates and compares their PFAs sorption behavior in terms of kinetics and isotherms; mechanisms involved in PFAS

adsorption processes, such as diffusion, electrostatic interaction, hydrophobic interaction, ion exchange, and hydrogen bond; and effects of the variability of the parameters on sorption process. Based on the literature reviewed, the article makes recommendations for future research on PFASs adsorption.

The Technology Innovation News Survey welcomes your comments and suggestions, as well as information about errors for correction. Please contact Michael Adam of the U.S. EPA Office of Superfund Remediation and Technology Innovation at adam.michael@epa.gov or (703) 603-9915 with any comments, suggestions, or corrections.

Mention of non-EPA documents, presentations, or papers does not constitute a U.S. EPA endorsement of their contents, only an acknowledgment that they exist and may be relevant to the Technology Innovation News Survey audience.