Technology Innovation News Survey

Entries for September 1-15, 2016

Market/Commercialization Information

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM, EPA REGION 6

U.S. Environmental Protection Agency, Region 5, Chicago, IL.
Federal Business Opportunities, FBO-5434, Solicitation SOL-R5-16-00006, 2016

The EPA Region 5 Contracting Office intends to issue an RFP for Region 6 Superfund Technical Assessment and Response Team (START) IV. Release of solicitation SOL-R5-16-00006 is anticipated in November 2016. The primary performance of work will be within Region 6 (AR, LA, NM, OK, and TX); however, contractors may need to respond to unforeseen national requirements and be able to perform outside Region 6 while maintaining a 24-hr, seven d/wk, yr-round response capability to EPA's needs during the anticipated 5-year base period. The contractor shall provide services to support response and site assessment activities related to the release or threat of release of oil, petroleum products, hazardous substances, weapons of mass destruction, or pollutants and contaminants that pose an actual or potential threat to human health or the environment. Several files, including a DRAFT SOW, are attached to the FedConnect notice at https://www.fedconnect.net/FedConnect/?doc=SOL-R5-16-00006&agency=EPA [Note: It may be necessary to copy and paste the URL into your browser for direct access.]. This procurement will be full and open under NAICS code 541620.

UNRESTRICTED INDEFINITE DELIVERY CONTRACTS (IDC) FOR A-E SERVICES WITHIN EPA REGION 2 AND THE NORTHWESTERN DIVISION

U.S. Army Corps of Engineers, USACE District, Kansas City, MO.
Federal Business Opportunities, FBO-5441, Solicitation W912DQ-17-R-3001, 2016

This announcement constitutes an open and unrestricted request for submittal of SF330 qualifications; it is not a request for proposals. The Northwestern Division (NWD) of the U.S. Army Corps of Engineers has a requirement to acquire A-E Hazardous, Toxic, and Radioactive Waste/ Environmental IDCs for execution of its environmental mission. The work will be located within EPA Region 2 and the NWD boundaries (the Kansas City, Omaha, and Seattle districts). The Government intends to award contracts to five unrestricted firms sharing $120M in total contract capacity under NAICS code 541330, Engineering Services. Each contract will have a base period of five years. Selected firms will work on a variety of projects, including but not limited to investigation and design of remedies for contaminated soil, groundwater, soil gas and indoor air, contaminated sediments, radioactive and mixed wastes, landfills, underground storage tanks, and fueling systems. SF330 packages must be received by 4:00 PM CT on November 22, 2016. Award of contracts is anticipated by August 2017 or earlier.
https://www.fbo.gov/spg/USA/COE/DACA41/W912DQ-17-R-3001/listing.html

OAK RIDGE OFFICE OF ENVIRONMENTAL MANAGEMENT TECHNICAL SUPPORT SERVICES

U.S. DOE, EM Consolidated Business Center, Cincinnati, OH.
Federal Business Opportunities, FBO-5416, Solicitation DE-SOL-0009142, 2016

DOE anticipates issuing an RFP as a small business set-aside to provide technical support services to the Oak Ridge Office of Environmental Management (OREM) under NAICS code 562910, Environmental Remediation Services. OREM is responsible for removing environmental legacies from decades of nuclear weapons development and government-sponsored research. DOE anticipates awarding a single IDIQ contract from which time-and-materials and firm-fixed-price task orders may be issued over an ordering period of five years from the date of contract award. Release of the RFP is anticipated toward the end of October. Interested parties are encouraged to review the RFP when it becomes available and provide questions and comments in writing to OREMTSS@emcbc.doe.gov. A dedicated webpage — https://www.emcbc.doe.gov/SEB/OREMTSS/ — has been established for this procurement, and information is also available at https://www.fedconnect.net/FedConnect/?doc=DE-SOL-0009142&agency=DOE [Note: It might be necessary to copy and paste the URL into your browser for direct access.]. Interested parties are encouraged to monitor the website for updates.

ENVIRONMENTAL REMEDIATION MULTIPLE AWARD IDIQ FY18

Army Contracting Command, MICC - Fort Sam Houston (JBSA), Texas.
Federal Business Opportunities, FBO-5431, Solicitation W9124J-17-R-0006, 2016

This notice provides only background information to the forthcoming procurement; no final RFP exists at this time. Anticipated work would be conducted in the program areas that fall under the Army Environmental Cleanup Program, i.e., Installation Restoration, Military Munitions Response, Base Realignment and Closure, Compliance Cleanup, and Operational Range Assessment. The Contractor will be required to provide a wide range of environmental investigations, remediation, and munitions response activities at various installations and locations throughout the United States, including the territories of Puerto Rico and the Virgin Islands. A DRAFT RFP dated 4 October 2016 is one of several draft attachments to the FedBizOpps notice. Interested vendors are invited to submit questions and comments on the draft solicitation prior to any formal RFP release. The Government contemplates award of a maximum of 8 IDIQ contracts as competitive small business set-asides, of which one may be reserved for a woman-owned small business, at an overall combined total of about $200M. The anticipated NAICS code is 562910, with a size standard of 750 employees. https://www.fbo.gov/notices/96aefe77bf68260409c51b04adab751d

ENVIRONMENTAL REMEDIATION SERVICES: FORMER BELLE MEAD ARMY DEPOT

General Services Administration, Public Buildings Service, Philadelplhia, PA.
Federal Business Opportunities, FBO-5432, Solicitation GS-03-P-17-AZ-C-0001, 2016

The General Services Administration has a requirement for the selection of a contractor to perform Environmental Remediation Services at the former Belle Mead Army Depot in Belle Mead, New Jersey. The work includes but is not limited to the following: all remediation services needed for removal of trees and other vegetation in the impacted areas, excavation and removal of contaminated soil as well as its transportation both on and off site, construction of a containment cap, placement of clean fill, and coordination and application for all necessary permits and approvals. All services under this solicitation must comply with NJDEP regulations and be completed by December 2018. The tentative date for release of the RFP on FedBizOpps is on or about October 19, 2016. This requirement is a total small business set-aside, NAICS code 562910, with a size standard of 750 employees. Award will be a firm-fixed-price contract, and the procurement method will be a competitive negotiated RFP. https://www.fbo.gov/notices/1b71fd897af0e906dc3c36d0be071962

Cleanup News

PHYTOREMEDIATION OF SALT AND PETROLEUM HYDROCARBON IMPACTED SOIL: AN INNOVATIVE AND COST EFFECTIVE GREEN TECHNOLOGY FOR USE AT REMOTE SITES

McKeown, J., B. Poltorak, K. Cryer, P. Gerwing, and B. Greenberg.
SustainTech 2016, Saskatoon, SK, Canada, 12 April 2016. 49 slides, 2016

Phytoremediation activities on the Nota Creek C-17 well site, including introduction of plant growth-promoting rhizobacteria, have been ongoing since 2008. The site is affected by petroleum hydrocarbons and highly saline drilling waste. Numerous previous attempts by others to establish vegetation were unsuccessful. Now plants are healthy but are heavily grazed by wildlife (e.g., musk oxen). In mid-June, pre-planting soil samples are collected and then the site is conditioned, fertilized, and seeded. A monitoring trip to the site in mid-August assesses plant health and vigor. In mid-September, plant and soil samples are collected and growth is harvested from the affected areas. Recent sampling results suggest that additional impacted soil could be spread out on site and integrated into the phytoremediation process.
http://seima.sk.ca/resources/Documents/SustainTech%202016/SustainTech%202016%20Presentations/SustainTech%20presentation%20Justin%20McKeown%202016.pdf
See additional information on this study in the NWT Research Database at http://data.nwtresearch.com/Scientific/14224.

UTILIZING AN IN SITU GROUNDWATER RECIRCULATION BIOREMEDIATION PROCESS TO REMEDIATE A HYDROCARBON RELEASE ON AN ACTIVE CRUDE OIL PRODUCTION PAD, NORTH DAKOTA

Bueltel, E., IPEC 2015: 22nd Annual International Petroleum Environmental Conference, 97 PowerPoint slides, 2015

An underground pipeline and surface spills released crude oil to the subsurface at an active oil production facility in North Dakota, leaving LNAPLs and dissolved-phase BTEX in the groundwater. Free-product recovery equipment was operated at the site for several years to remove as much product as was practical. Following the recovery effort, in situ bioremediation in combination with surfactant-enhanced LNAPL recovery and groundwater recirculation was selected for the ability of this process to reduce both LNAPL thickness and dissolved-phase BTEX contaminants. Careful planning and setup allowed for efficient full-scale implementation of these remedies while causing minimal disruption to ongoing facility operations. The in situ bioremediation approach employed the Dissolved Oxygen Insitu Treatment (DO-IT™) system. Results collected over one year demonstrated the effectiveness of in situ bioremediation combined with groundwater recirculation as a treatment option for upstream, midstream, downstream, and retail sites with persistent LNAPL and dissolved-phase contaminants. **Slides:**
http://ipec.utulsa.edu/Conf2015/Manuscripts/Bueltel_Utilizing.pptx

Demonstrations / Feasibility Studies

A FIVE-YEAR PERFORMANCE REVIEW OF FIELD-SCALE, SLOW-RELEASE PERMANGANATE CANDLES WITH RECOMMENDATIONS FOR SECOND-GENERATION IMPROVEMENTS

Christenson, M., A. Kambhu, J. Reece, S. Comfort, and L. Brunner.
Chemosphere 150:239-247(2016) doi: 10.1016/j.chemosphere.2016.01.125

In 2009, a TCE plume was identified at an abandoned landfill located in a low-permeable silty-clay aquifer. Investigators manufactured slow-release potassium permanganate cylinders (oxidant candles) of 91.4 cm length and either 5.1 or 7.6 cm diameter. Equal masses of the oxidant candles were installed differently: the 5.1-cm dia candles were inserted with direct-push rods while the 7.6-cm candles were housed in screens and lowered into 10 permanent wells. This paper provides a 5-yr performance review. Since installation, the 7.6-cm oxidant candles have been refurbished annually by gently scraping off surface oxides. Temporal sampling shows oxidant candles placed in wells have steadily reduced migrating TCE concentrations, maintain an inner core of oxidant that has yet to contribute to the dissolution front and should provide several more years of service. Oxidant candles inserted by direct push stopped reducing TCE concentrations because of scale buildup on the outer candle surface. To counteract oxide scaling, sodium hexametaphosphate was added to a second generation of oxidant candles, which show better release characteristics and are less prone to oxide scaling. http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1028&context=watercenterpubs
2012 performance review: http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1332&context=natrespapers

SIMULTANEOUS REMOVAL OF PCDD/FS, PENTACHLOROPHENOL AND MERCURY FROM CONTAMINATED SOIL

Hung, P.-C., S.-H. Chang, C.-C. Ou-Yang, and M.-B. Chang.
Chemosphere 144:50-58(2016)

PCP, PCDD/Fs, and mercury (Hg) were simultaneously removed from heavily contaminated soil using a continuous pilot-scale thermal system (CPTS). Operating the system at 700°C for 22 min retention time ensured that the residual contaminants in remediated soil were lower in concentration than the soil standards required by Taiwan EPA. Although both PCP and PCDD/Fs were destroyed during high-temperature treatment in the CPTS, significant dechlorination of PCDD/Fs was observed, resulting in lower net destruction efficiencies of TCDD/F and PeCDD/F-congeners compared with those of highly chlorinated Hx-, Hp- and OCDD/F congeners. Moreover, 2,3,7,8-TetraCDD formed if the retention time was not long enough for total destruction. Inadequate reaction time (or retention time) may lead to a rise in TEQ value due to incomplete dechlorination. Hg was desorbed from the contaminated soil and discharged through the exhaust. For PCP and PCDD/Fs, the exhaust discharge percentages, including both the remediated soil and the exhaust, were

Research

REDUCTION OF HEXAVALENT CHROMIUM BY GREEN SYNTHESIZED NANO ZERO VALENT IRON AND PROCESS OPTIMIZATION USING RESPONSE SURFACE METHODOLOGY

Yirsaw, B.D., M. Megharaj, Z. Chen, and R. Naidu.
Environmental Technology & Innovation 5:136-147(2016)

Hexavalent chromium [Cr(VI)] is a reducible contaminant. A combination of mango peel and nanoscale zero-valent iron (GMP-NZVI) was analyzed for its ability to remove Cr from aqueous solution. To determine the optimum operating conditions for removing Cr(VI), response surface methodology (RSM) was applied. EDS and XPS analyses confirmed the reduction of Cr(VI) to Cr(III) and subsequent adsorption on the surface of the GMP-NZVI. RSM highlighted the role of GMP-NZVI concentration, pH, and the initial Cr load in Cr(VI) reduction, of which pH was the greatest contributor (61%).

RADIAL BASIS FUNCTION SIMULATION OF SLOW-RELEASE PERMANGANATE FOR GROUNDWATER REMEDIATION VIA OXIDATION

Yao, G., K.M. Bliss, M. Crimi, K.R. Fowler, J. Clark-Stone, W. Li, and P.J. Evans.
Journal of Computational and Applied Mathematics 307(C):235-247(2016)

Permanganate cylinders for contaminant oxidation are only a few inches in diameter and can be placed in wells or pushed directly into the subsurface. This work focuses on modeling and simulation of the reactive process. The underlying model is a coupled system of nonlinear partial differential equations accounting for advection, dispersion, and reactive transport for a contaminant and the permanganate in two spatial dimensions. The radial basis functions collocation method is used to simulate different spatial arrangements of the cylinders to understand the behavior of the system and gain insight into designing a remediation strategy for a large-scale contaminated region. Because radial basis function collocation is a meshless method, the locations of the cylinders are not tied to a numerical grid, making it an attractive choice for determining optimal placement. The focus is to (1) identify a domain of influence (DOI) measuring the effectiveness of the injected cylinders, (2) understand the placement for multiple cylinders required to clean up a given domain, and (3) determine a protocol for injecting multiple cylinders over time. Numerical results show that DOI is a way to measure the effectiveness of installed cylinders. In simulations, placement of two cylinders in an area 13 ft x 3 ft and three sources in an area of 26 ft x 6 ft were enough to clean the contaminant within a reasonable period.

INJECTABLE SILICA-PERMANGANATE GEL AS A SLOW-RELEASE MNO_4^- SOURCE FOR GROUNDWATER REMEDIATION: RHEOLOGICAL PROPERTIES AND RELEASE DYNAMICS

Yang, S., M. Oostrom, M.J. Truex, G. Lia, and L. Zhong.
Environmental Science: Processes & Impacts 18(2):256-264(2016)

Injectable slow-release permanganate gels (ISRPGs) formed by mixing aqueous $KMnO_4$ solution with fumed silica powders might have potential application in remediating chlorinated solvent plumes in groundwater. A series of batch, column, and 2-D flow-cell experiments was completed to characterize the ISRPG and study permanganate release under a variety of conditions. The experiments have provided information on ISRPG rheology, permanganate release dynamics and distribution in porous media, and TCE destruction by the ISRPG-released oxidant. The gel possesses shear thinning characteristics, resulting in a relatively low viscosity during mixing and facilitating subsurface injection and distribution. Batch tests clearly showed that permanganate diffused out from the ISRPG into water. During this process, the gel did not dissolve or disperse into water, but rather maintained its initial shape. Column experiments demonstrated that permanganate release from the ISRPG lasted considerably longer than from an aqueous solution. Due to the longer release duration, TCE destruction by ISRPG-released permanganate was considerably more effective than when permanganate was delivered using aqueous solution injection. In the 2-D flow cell experiments, ISRPGs released a long-lasting, low-concentration permanganate plume.

TREATING METALS IN ACID MINE DRAINAGE USING SLOW-RELEASE HYDROGEN PEROXIDE

Miller, Samuel A., Master's thesis, Ohio University, 92 pp, 2015

Proof-of-concept iron removal tests indicate that slow-release hydrogen peroxide (SR-HP) forms can efficiently remove Fe^{2+} from acid mine drainage (AMD) within one minute. Ideal $[Fe^{+2}]/[H_2O_2]$ ratios for >80% Fe^{2+} removal clustered around 2, with decreasing Fe^{2+} removal as the ratio increases. A small-scale field test demonstrated the efficacy of SR-HP at oxidizing Fe^{2+}: ferrous iron concentrations were reduced by 80% within the first hour of treatment. http://rave.ohiolink.edu/etdc/view?acc_num=ohiou1430918808

REMOVING PAHS FROM URBAN RUNOFF WATER BY COMBINING OZONATION AND CARBON NANO-ONIONS

Sakulthaew, C., S.D. Comfort, C. Chokejaroenrat, X. Li, and C.E. Harris.
Chemosphere 141:265-273(2015) doi: 10.1016/j.chemosphere.2015.08.002

Ozone (O_3) is a chemical oxidant capable of transforming PAHs in urban runoff within minutes, but complete oxidation to CO_2 can take days to weeks. A flow-through system is described that uses ozone to quickly transform PAHs in a runoff stream and then removes the ozone-transformed PAHs via adsorption to carbon nano-onions (CNOs). To quantify the efficacy of this approach, C-14-labeled phenanthrene and benzo(a)pyrene and a mixture of 16 unlabeled PAHs were used as test compounds. The PAHs were pumped from a reservoir into a flow-through reactor that continuously ozonated the solution. Outflow from the reactor then went to a chamber that contained CNOs to which the ozone-transformed PAHs adsorbed, allowing clean water to pass. After addition of a microbial consortium to the CNOs following adsorption, bacteria were able to degrade the adsorbed products and release more soluble, biodegradable products back into solution. Control treatments confirmed that parent PAH structures (i.e., non-ozonated) were not biologically degraded following CNO adsorption and that O_3-transformed PAHs were not released from the CNOs in the absence of bacteria.

ACTIVATED PERSULFATE OXIDATION OF PERFLUOROOCTANOIC ACID (PFOA) IN GROUNDWATER UNDER ACIDIC CONDITIONS

Yin, P., Z. Hu, X. Song, J. Liu, and N. Lin.
International Journal of Environmental Research and Public Health 13(6):602(2016)

In an investigation of the degradation of PFOA using activated persulfate under mild conditions, the impact of pH, temperature (25-50°C), persulfate dosage, and reaction time on persulfate activity was evaluated under different experimental conditions. Contrary to traditional alkaline-activated persulfate oxidation, it was found that PFOA can be degraded effectively using activated persulfate under acidic conditions, with the degradation kinetics following the pseudo-first-order decay model. Higher temperature, higher persulfate dosage and increased reaction time generally result in higher PFOA degradation efficiency. A PFOA degradation efficiency of 89.9% was achieved by activated persulfate at pH 2.0, 50°C, 1:100 molar ratio PFOA:persulfate, and 100 h reaction time. The corresponding defluorination ratio under these conditions was 23.9%, indicating that not all PFOA decomposed via fluorine removal. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4924059/ [Note: It might be necessary to copy and paste the URL into your browser for direct access.]

BREAKDOWN OF PFOA, PFOS AND 6:2FTS USING ACIDIC POTASSIUM PERMANGANATE AS OXIDANT

Fang, C., M. Megharaj, and R. Naidu. Austin Environmental Sciences 1(1):id1005(2016)

The discovery that inert fluoro-carbon skeletons of PFOA, PFOS, and 1H, 1H, 2H, 2H-perfluorooctanesulfonic acid (6:2FTS) could be broken down by potassium permanganate as oxidant in acidic liquid phase at room temperature was confirmed with HPLC-MS and ion chromatography data. Due the contribution of oxidization, the half-life of the fluoro-carbon skeletons was estimated to be ~3 months, much shorter than the several decades that occur in nature. The discovery opens a new approach to remediation of aqueous film-forming foams. http://austinpublishinggroup.com/environmental-sciences/download.php?file=fulltext/aes-v1-id1005.pdf

TREATMENT TECHNOLOGIES FOR AQUEOUS PERFLUOROOCTANESULFONATE (PFOS) AND PERFLUOROOCTANOATE (PFOA): A CRITICAL REVIEW WITH AN EMPHASIS ON FIELD TESTING

Espana, V.A.A., M. Mallavarapua, and R. Naidu.
Environmental Technology & Innovation 4:168-181(2015)

Of technologies tested for removing PFOS and PFOA from water, most have not been developed past lab scale. This paper provides a critical review of existing methods for removing PFOS and PFOA from wastewaters with an emphasis on identifying processes that show promise for the development of practical industrial-scale remediation. Among the treatment technologies cited in the literature, removal by activated carbon (AC) has been the most widely used, with several successful field tests reported. The use of AC has limitations, however, such as lesser effectiveness at removing PFOA and other PFASs. Other adsorbents that have the potential to treat aqueous PFOS and PFOA include organo-clays, clay minerals, and carbon nanotubes.

SELECTIVE AND HIGH SORPTION OF PERFLUOROOCTANESULFONATE AND PERFLUOROOCTANOATE BY FLUORINATED ALKYL CHAIN MODIFIED MONTMORILLONITE

Du, Z., S. Deng, S. Zhang, B. Wang, J. Huang, Y. Wang, G. Yu, and B. Xing.
Journal of Physical Chemistry C 120(30):16782-16790(2016)

A novel fluorinated montmorillonite (F-MT) was synthesized via exchange of cationic fluorinated surfactant to selectively adsorb PFOS and PFOA from water. F-MT displayed fast and high sorption for PFOS and PFOA at concentrations

KINETICS OF THE ELECTROCHEMICAL MINERALIZATION OF PERFLUOROOCTANOIC ACID ON ULTRANANOCRYSTALLINE BORON DOPED CONDUCTIVE DIAMOND ELECTRODES

Urtiaga, A., C. Fernandez-Gonzalez, S. Gomez-Lavin, and I. Ortiz.
Chemosphere 129:20-26(2015)

Model aqueous solutions of PFOA (100 mg/L) were electro-oxidized under galvanostatic conditions in a flow-by undivided cell provided with a tungsten cathode and an anode formed by a commercial ultrananocrystalline boron-doped diamond coating on a niobium substrate. A systematic experimental study was conducted to analyze the influence of the following operation variables: (i) the supporting electrolyte, $NaClO_4$ (1.4 and 8.4 g/L) and Na_2SO_4 (5 g/L); (ii) the applied current density, j_{app}, in the range 50-200 A/m^2; and (iii) the hydrodynamic conditions in terms of flowrate in the range 0.4×10^{-4} - 1.7×10^{-4} m^3/s and temperature in the range 293-313 K. After 6 h of treatment and at j_{app} 200 A/m^2, PFOA removal was >93%, and the mineralization ratio obtained from the decrease of the total organic carbon was 95%. The electrochemical generation of hydroxyl radicals in the supporting electrolyte was experimentally measured based on their reaction with dimethyl sulfoxide. The enhanced formation of hydroxyl radicals at higher j_{app} was related to the faster kinetics of PFOA removal. http://grupos.unican.es/pasep/PUBLICATIONS/2015/8.%20Ane%20Urtiaga.pdf

COMPLETE DEFLUORINATION OF PERFLUORINATED COMPOUNDS BY HYDRATED ELECTRONS GENERATED FROM 3-INDOLE-ACETIC-ACID IN ORGANOMODIFIED MONTMORILLONITE

Tian, H., J. Gao, H. Li, S.A. Boyd, and C. Gu.
Scientific Reports 6:32949(2016) DOI: 10.1038/srep32949

A unique process is reported for achieving complete defluorination and decomposition of perfluorinated compounds. Photogenerated hydrated electrons derived from 3-indole-acetic-acid within an organomodified clay induce the reductive defluorination of co-sorbed perfluorinated compounds. The process proceeds to completion within a few hours under mild reaction conditions. The organomontmorillonite clay promotes the formation of highly reactive hydrated electrons by stabilizing indole radical cations formed upon photolysis and prevents their deactivation by reaction with protons or oxygen. In the constrained interlayer regions of the clay, hydrated electrons and cosorbed perfluorinated compounds are brought into near proximity, thus increasing the probability of reaction. https://pdfs.semanticscholar.org/a3d2/7ab6b2006fc0b8c3cf0d311e922cd9209115.pdf [Note: It might be necessary to copy and paste the URL into your browser for direct access.]

CHEMISORPTION OF PERFLUOROOCTANOIC ACID ON POWDERED ACTIVATED CARBON INITIATED BY PERSULFATE IN AQUEOUS SOLUTION

Sun, B., J. Ma, and D.L. Sedlak.

Environmental Science & Technology 50(14):7618-7624(2016)

PFOA was exposed to sulfate radicals produced by thermolysis of persulfate ($S_2O_8^{2-}$) in the presence of powdered activated carbon (PAC). Under acidic conditions, thermal activation of persulfate resulted in transformation of PFOA to shorter-chain-length perfluorinated compounds, as previously reported, but when thermolysis of persulfate occurred under circumneutral pH conditions in the presence of PAC, a new removal pathway for PFOA was observed. Under these conditions, the removal of PFOA was attributable to chemisorption, a process in which PAC catalyzed persulfate decomposition and reacted with the transformation products to produce covalently bound PFOA. At PAC concentrations between 200 and 1000 mg/L and an initial PFOA concentration of 0.5 µM, covalent bonding resulted in removal of 10-40% of the PFOA, as well as removal of more than half of a more hydrophilic perfluoroalkyl acid (i.e., perfluorobutanoic acid, PFBA), which was greater than the amount of PFBA removed by physical adsorption on PAC. Although the high reaction temperatures (i.e., 80°C) and relatively high doses of PAC used in this study may be impractical for drinking water treatment, the process might be applied to the treatment of these recalcitrant compounds in industrial effluent and waters that contain high concentrations of PFOA and other perfluorocarboxylic acids. http://superfund.berkeley.edu/pdf/483.pdf

ENVIRONMENTAL FATE AND EFFECTS OF POLY- AND PERFLUOROALKYL SUBSTANCES (PFAS)

Pancras, T., G. Schrauwen, T. Held, K. Baker, I. Ross, and H. Slenders.
Concawe, Brussels. Report no. 8/16, 121 pp, 2016

Based upon a review of published literature on the environmental fate and effects of PFASs, this report is intended to enhance the understanding and management of environmental and human health risks associated with current and legacy formulations of PFAS-based class B fire-fighting foams. The report describes the main PFAS types with their use, toxicity data, and fate and transport properties, and provides an overview of chemical analysis and remedial techniques.
https://www.concawe.eu/publications/558/40/Environmental-fate-and-effects-of-poly-and-perfluoroalkyl-substances-PFAS-report-no-8-16

MICROBIAL TOXICITY AND BIODEGRADABILITY OF PERFLUOROOCTANE SULFONATE (PFOS) AND SHORTER CHAIN PERFLUOROALKYL AND POLYFLUOROALKYL SUBSTANCES (PFASS)

Ochoa-Herrera, V., J.A. Field, A. Luna-Velasco, and R. Sierra-Alvarez.
Environmental Science: Processes and Impacts 18(9):1236-1246(2016)

PFOS has raised public concern due to its high bioaccumulative character, environmental persistence, and toxicity. Shorter PFASs such as perfluorobutane sulfonate and polyfluoroalkyl compounds have been proposed as alternatives to PFOS, but it is unclear whether these fluorinated substances pose a toxicity risk. In an investigation of the microbial toxicity and the susceptibility to microbial degradation of PFOS and several related fluorinated compounds (i.e., short-chain per- and polyfluoroalkyl sulfonic and carboxylic acids), none of the compounds tested were toxic to the methanogenic activity of anaerobic wastewater sludge even at very high concentrations (up to 500 mg/L), whereas all PFASs evaluated were highly resistant to microbial degradation. PFOS was not reductively dehalogenated by an anaerobic microbial consortium even after very long periods of incubation (3.4 years). Similarly, the tested short-chain perfluoroalkyl substances and a polyfluoroalkyl PFOS analogue (6:2 fluorotelomer sulfonic acid) were also resistant to anaerobic biodegradation. No conclusive evidence of microbial degradation was observed under aerobic conditions for any of the short-chain per- and polyfluoroalkyl carboxylic acids tested after 32 weeks of incubation. Collectively, these results indicate that PFOS and its tested alternatives are highly resistant to microbial degradation. *Early work on this study is available in* ***Chapter 4 (pp 138-185)*** *of V. Ochoa-Herrera's dissertation at* http://arizona.openrepository.com/arizona/handle/10150/194214.

POTENTIOMETRIC DETECTION OF AFFFS BASED ON MIP

Fang, C., Z. Chen, M. Megharaj, and R. Naidu.
Environmental Technology & Innovation 5:52-59(2016)

Potentiometric detection of fluoro-surfactants formulated in AFFFs (aqueous film-forming foams) was demonstrated using molecular imprinted polymer (MIP) formed on pencil lead. The introduction of methylene blue (MB) into the polymer matrix of polypyrrole increased selectivity due to the formation of ion-pairs of AFFF-MB. Fluoro-surfactants, including PFOA; PFOS; and 1H,1H,2H,2H-perfluorooctanesulfonic acid (6:2FTS) were specifically detected in the range of 10 µM to 10 mM with the limit of detection down to ~100 nM (~41 ppb for PFOA). Interference from anionic surfactants of sodium dodecyl sulphate and dodecylbenzenesulfonic acid sodium was tested with negative response.

SURFACE-ENHANCED RAMAN SCATTERING (SERS) DETECTION OF FLUOROSURFACTANTS IN FIREFIGHTING FOAMS

Fang, C., M. Megharaj, and R. Naidu.
RSC Advances 6:11140-11145(2016)

SERS detection of fluorosurfactants (FSs) was demonstrated by increasing their loading affinity and boosting their Raman activity. A cationic dye (ethyl violet or methyl blue) was introduced into the aqueous incubation solution to increase FS loading affinity by co-precipitating the FS onto the SERS substrate surface by forming an immiscible ion-pair (dye-FS). Meanwhile, the Raman signal intensity was boosted due to the much higher Raman activity of the dye than of the FS. Comparison of two kinds of SERS substrate—patterned silver (Ag) surface and graphene oxide (GO) membrane—showed the former (dye-FS-Ag) enhanced the Raman signal, while the latter (dye-FS-GO) increased the loading affinity of the ion-pair owing to the hydrophobic surface. Silver nanoparticles (AgNPs) were introduced into the incubation solution (as well as dye) to co-precipitate FS onto the GO surface via an assembly of dye-FS-AgNP-GO. This assembly yielded successful detection of PFOA; PFOS; and 1H,1H,2H,2H-perfluorooctanesulfonic acid (6:2FTS), with a limit of detection of ~50 ppb (~120 nM) for PFOA.

General News

WASTE MANAGEMENT AND THE ENVIRONMENT VIII

Brebbia, C.A. and H. Itoh.
WIT Press, ISBN: 978-1-78466-087-1, WIT Transactions on Ecology and the Environment, Volume 202, 434 pp, 2016

Waste Management and the Environment VIII contains a selection of papers presented at the 8th International Conference on Waste Management and the Environment, organized every two years by the Wessex Institute. The contents—contributed by professionals, researchers, government departments, and local authorities—cover current issues in waste management, including hazardous materials. Many of the papers from the conference have been posted **Open Access** at http://www.witpress.com/elibrary/wit-transactions-on-ecology-and-the-environment/202.

REGIONAL SCREENING LEVELS (RSLS): USER'S GUIDE

U.S. Environmental Protection Agency website, May 2016

The purpose of this website is to provide default screening tables and a calculator to assist remedial project managers, on-scene coordinators, risk assessors, and others involved in decision-making concerning CERCLA hazardous waste sites to determine whether levels of contamination found at the site may warrant further investigation or site cleanup, or whether no further investigation or action may be required. The guidance sets forth a recommended but not mandatory approach based upon currently available information with respect to risk assessment (human health only, not ecological) for response actions at CERCLA sites. https://www.epa.gov/risk/regional-screening-levels-rsls-users-guide-may-2016

GUIDANCE FOR REMEDIATION OF PETROLEUM CONTAMINATED SITES

State of Washington, Department of Ecology, Toxics Cleanup Program.
Publication No. 10-09-057, 248 pp, 2016

This document is primarily intended to provide guidance to persons with technical backgrounds and experience in contaminated site cleanup, including Washington Ecology Cleanup Project Managers (site managers), consultants, and contractors. Others—such as owners and operators of facilities that have experienced petroleum releases, property owners affected by petroleum releases from nearby properties, and the general public—may also find this guidance useful. In addition to State-specific requirements, the guide contains recommendations and best management practices that are not mandated by law. https://fortress.wa.gov/ecy/publications/documents/1009057.pdf

REGENERATION OF BROWNFIELD LAND USING SUSTAINABLE TECHNOLOGIES (ROBUST)

CL:AIRE (Contaminated Land: Applications in Real Environments), RB 19, 6 pp, 2016

The sustainable technologies employed in the 5-yr ROBUST project used waste products from industries, including the water treatment, mineral extraction, and steel-making sectors. This bulletin describes the main outputs from the ROBUST project. http://www.claire.co.uk/component/phocadownload/category/11-research-bulletins?download=527:rb19robust

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.