Technology Innovation News Survey

Entries for February 1-15, 2020

Market/Commercialization Information

$176.25M SMALL BUSINESS PREPLACED REMEDIAL ACTION CONTRACT MATOC UNDER THE MEGA FOR OMAHA DISTRICT, NORTHWESTERN DIVISION

U.S. Army Corps of Engineers (USACE), W071, Omaha District, NE.
Contract Opportunities on Beta.Sam.gov, Solicitation W9128F20R0038, 2020

This procurement is a total small business set-aside (NAICS code 562910) as a part of the USACE Multiple Environmental Government Acquisition (MEGA) strategy. This solicitation has a target of 10 IDIQ contract awards within a maximum shared capacity of $176.25M. Projects will include Installation Restoration Program activities on active Army, Navy, and Air Force installations and on formerly used defense sites for services related to requirements for RCRA, CERCLA, EPA's Emerging Contaminants Program, the NCP, and the MMRP. Proposals are due by 2:00 PM CT on April 3, 2020.
https://beta.sam.gov/opp/e3896fca7e454f5a920d6be945652d02/view

MULTIPLE ENVIRONMENTAL GOVERNMENTAL ACQUISITION (MEGA)

U.S. Army Corps of Engineers (USACE) W07V, St. Louis, MO.
Contract Opportunities on Beta.Sam.gov, Solicitation W912P920R0002, 2020

This solicitation is a 100% small business set-aside for an IDIQ contract with a basic ordering period of three years plus one 2-year option period under NAICS code 562910 (Remediation Services), size standard 750 employees. The USACE St. Louis District intends to award five contracts from this solicitation under its MEGA strategy, shared contract capacity not to exceed $88.125M. The work will require personnel, plant, and equipment to respond to numerous USACE requests for environmental support. This Pre-placed Remedial Action Contract will primarily support work assigned to the USACE Mississippi Valley Division, St. Louis District, with the majority of the work potentially conducted to support projects for U.S. EPA Regions 5 and 7. Offers are due by 2:00 PM CT on April 6, 2020. https://beta.sam.gov/opp/c0eb33de95114d7cb4833ffc465dec06/view

SAFE HOME INITIATIVE

U.S. Coast Guard Base Kodiak (00045), AK.
Contract Opportunities on Beta.Sam.gov, 2020

These requirements are total small business set-asides, NAICS code 541620 (Environmental Consulting Services). The U.S. Coast Guard requires contractor services at two locations in Alaska to conduct a thorough risk assessment in accordance with EPA and HUD guidelines for asbestos-containing materials (ACM), lead-based paint (LBP), lead dust, and radon.
•Solicitation 70Z04520QP3200600 is for 28 housing units/areas at Valdez, Alaska - https://beta.sam.gov/opp/624528b01530487392de9b698a51f43d/view
•Solicitation 70Z04520QP3200800 is for 10 housing units/areas at Homer, Alaska - https://beta.sam.gov/opp/3b931d255ece4b14946208cd689017e7/view
The risk assessments must include an on-site investigation to determine the presence, type, severity, and location of LBP, lead dust, ACM and radon hazards (including lead hazards in paint, dust, and soil) in addition to providing recommendations to control or eliminate them. The risk assessments shall be performed only by a certified lead and asbestos risk assessor. Offers are due by 8:00 PM ET on April 8, 2020.

BEALE AFB OPTIMIZED REMEDIATION CONTRACT (ORC)

U.S. Army Engineer District, Sacramento, CA.
Contract Opportunities on Beta.Sam.gov, Solicitation W9123820R0002, 2020

This acquisition of an ORC for Beale AFB, CA, is issued as a total small business set-aside, NAICS code 562910. The range of activities necessary to conduct environmental remediation activities at Beale AFB includes maintenance of established remedies, implementation of optimization to enhance remedial progress at applicable sites, and achievement of site-specific objectives as identified in the contract. During the 10-year period of performance, Contractor shall undertake environmental remediation activities to achieve performance objectives at 15 Installation Restoration Program sites and eight Military Munitions Response Program sites. The resulting contract type is expected to be firm fixed price. Substantial GFI is available, but the files are too large to upload to beta.sam. Email the POCs identified in the notice at beta.sam to be added to the GFI distribution list. Offers are due by 4:00 PM PT on April 13, 2020.
https://beta.sam.gov/opp/8328a790ea9b4ecab285fae65e74dcc9/view

GROUNDWATER RD/RA, D-Q UNIVERSITY FUDS ID J09CA1180, YOLO COUNTY, CA

U.S. Army Engineer District Sacramento, CA.
Contract Opportunities on Beta.Sam.gov, Solicitation W9123820R0030, 2020

This acquisition is a 100% small business set-aside with no sub-socioeconomic category set-aside, NAICS code 562910. Award of this action is expected to be a standalone "C"-type contract. The overall project objective is to remediate the TCE groundwater plume at the D-Q University FUDS in compliance with the decision document (USACE, 2018). Remedial design and remedial action are required to meet the objective. Offers are due by 4:00 PM PT on April 13, 2020.
https://beta.sam.gov/opp/376f5c5b9c6348aa9f16b566c25b1f94/view

COBRATF TRAINING OPERATIONS AND SUPPORT SERVICES

FEMA, Acquisition Operations Division/Preparedness Section, Washington, DC.
Contract Opportunities on Beta.Sam.gov, Solicitation 70FA2020R00000004, 2020

The Government intends to award a firm-fixed-price/cost-reimbursement hybrid contract as a total small business set-aside for training operations and support services for FEMA's Center for Domestic Preparedness (CDP). The CDP national training facility prepares emergency response personnel to respond to all hazards, including terrorist attacks using weapons of mass destruction, by providing advanced, hands-on training to state, local, tribal, federal, private sector, and international responders. The intent of this solicitation is to obtain contracted comprehensive training operations and support services for the Chemical, Ordnance, Biological, and Radiological Training Facility (COBRATF) located in Anniston, AL. COBRATF has unique requirements to manage a training venue where chemical and biological agents are used in a specialized training environment that requires supervision on a 24-hour, 7-day-a-week basis. For details, see the 29 attachments at https://beta.sam.gov/opp/89446a129a3141cca83ab69a1b3bb56e/view. The NAICS code is 562211, size standard $41.5M. The anticipated contract performance start date is January 15, 2021, for a period of performance of a base year and four 12-month options. Proposals are due by 4:00 PM ET on April 16, 2020. https://beta.sam.gov/opp/754f3cb0928247de82cff5461dc198da/view

Cleanup News

IN SITU TREATMENT OF A DILUTE CHLORINATED SOLVENT PLUME IN AN ACIDIC AEROBIC AQUIFER

Alexander, M. | Remediation 30(2): 25-35(2020)

In situ bioremediation was selected to remediate a 29-acre dilute, acidic and aerobic, chlorinated solvent plume (mainly TCE and 1,1-DCE) at the Monitor Devices Inc./Intercircuits Inc. Superfund site in New Jersey. Full-scale implementation of the reductive dechlorination and bioaugmentation began in late 2010, and treatment continued steadily over 9 years. The amendments injected included electron donor and bicarbonate buffer solution and, once anaerobic aquifer conditions became established, a bioaugmentation culture. Amendments were injected in multilevel injection wells (IWs), to maintain control over the vertical interval of amendment delivery. The areal coverage of the plume has been reduced by 59% based on the 10 µg/L TCE isocontour and the contaminant mass has been reduced by 79%. Lessons learned from this project include the need for bioaugmentation in the acidic aquifer and an efficient and effective manner of well construction and amendment injection using multiscreen single casing IWs and packer systems. Also, there were differences in longevity of the electron donor amendment versus the bicarbonate neutralization additive, and varied amendment delivery techniques (IWs, direct injection, horizontal well installation) were needed in selected lower permeable zones to attain treatment.

INVESTIGATIVE AREA 12 OPERABLE UNIT-2 INTERIM REMEDIAL MEASURE PROGRESS REPORT HOFFMANN-LA ROCHE INC. SITE, 340 KINGSLAND STREET, NUTLEY, NEW JERSEY

Hoffmann-La Roche Inc., 21 pp, 2019

Operable unit (OU) 2 of the Hoffman-La Roche Inc. site was contaminated with >1,000 to 2 in the central portion of IA-12 was subsequently installed as an interim remedial measure. (IRM) Three separate treatment systems operated from July 2016 through 2017. Seventy-eight ISCO wells injected ozone in all areas and supplemental activated sodium persulfate was injected in one area. Twenty-five IWAS wells and 16 vapor extraction trenches along the perimeter of the main injection treatment areas were installed to promote additional vapor recovery and capture sparged gases. Groundwater sampling results through October 2018 showed a significant overall reduction in PCE+ concentrations. An overall 69% reduction in PCE+ concentrations was achieved at system shutoff in December 2017. Only minor rebound/recontamination was observed with an overall 55% reduction in PCE+ concentrations was attained 10 months after cessation of IRM.
https://www.roche-nutley.com/content/dam/roche-nutley/en/documents/RocheNutley/pdfs/gw_irm_apr_19/2019-4-18_IA-12_OU-2%20IRM%20RptTEXT.pdf

TRANSFORMING AN OIL FIELD WASTE DISPOSAL FACILITY INTO RESIDENCES AND HABITAT - NORTH SHORE AT MANDALAY BAY
Schuetz, M. | 2nd Annual Western Groundwater Conference, 17-19 September, Sacramento, CA, 36 slides, 2019

Previous activities at the 90.26-acre former waste disposal facility contaminated soil and groundwater with VOC, SVOC, total petroleum hydrocarbons, heavy metals, and PCBs. After extensive remedial efforts, sampling in 2015 showed low concentrations of VOCs remained in soil gas and groundwater in limited subsurface locations where residential housing redevelopment was planned, posing a potential vapor intrusion risk. To mitigate the soil contamination, a 41-well soil vapor extraction (SVE) system was installed in two areas of the site. Within 18 months of operation, steady-state, diffusion-limited removal of VOCs was attained. Enhanced attenuation was implemented in areas with elevated groundwater VOC concentrations. Substrate materials were injected into groundwater, which accelerated natural attenuation to reduce residual VOC. Long-term groundwater monitoring is planned, and SVE monitoring will continue for >two years after treatment. Future work includes the installation of two vapor intrusion mitigation design options and a remote data monitoring system for each proposed residential building to address the potential soil vapor indoor air pathway. https://www.grac.org/media/files/files/a1e84ec6/19-3-2-c-melissa-schuetz.pdf *For more information, including site documents on the SVE system, see* https://www.envirostor.dtsc.ca.gov/public/profile_report.asp?global_id=19000021&mytab=activities

NOVEL SHORELINE CAP FOR CONTROLLING SHEEN AND DISSOLVED-PHASE CONSTITUENT DISCHARGE
Gentry, J.L., A. Salter-Blanc, K. Sheets, B. Sharma, L. Tochko, and S. Martin.
Remediation 30(2):5-14(2020)

Releases of petroleum LNAPL related to upland impacts caused occasional sheens on a portion of the Willamette River in the Portland Harbor Superfund site., OR. The frequency and volume of sheens decreased following the installation of an upland sheet pile barrier wall, but occasional sheens related to LNAPL stranded downgradient of the wall continued, prompting the design of a shoreline remedy. To mitigate the LNAPL and dissolved-phase groundwater constituents, a novel, multilayered shoreline cap was designed and installed. The cap was designed to mitigate sheen and to meet the objectives specified in the Portland Harbor Record of Decision including limiting the discharge of certain dissolved-phase constituents of interest. The cap design was the first instance of combining an oleophilic bio-barrier to mitigate sheen and an activated carbon layer to capture dissolved-phase constituents. No sheens have been visually observed since cap installation. *More information* https://www.deq.state.or.us/Webdocs/Controls/Output/PdfHandler.ashx?p=0da006fb-a778-45aa-a491-b2b982bbe3aepdf

Demonstrations / Feasibility Studies

ETHYLENE DIBROMIDE IN SITU BIODEGRADATION PILOT TEST REPORT BULK FUELS FACILITY SOLID WASTE MANAGEMENT UNITS ST-106 AND SS-111, KIRKLAND AIR FORCE BASE, NEW MEXICO
U.S. Army Corps of Engineers Omaha District, 247 pp, 2019

A pilot test was conducted at Units ST-106 and SS-111 to investigate potential treatment amendments for anaerobic in situ bioremediation of ethylene dibromide (EDB) at the Bulk Fuels Facility on Kirtland AFB. Using one injection and groundwater circulating, two extraction, and six monitoring wells and the pilot test evaluated baseline conditions followed by biostimulation in the subsurface after distribution of treatment amendments in recirculated groundwater, bioaugmentation, and long-term monitoring. Baseline EDB concentrations ranged from 20.1-432 µg/L in shallow wells; virtually no EDB was detected in intermediate wells suggesting biologically active subsurface. At the pilot conclusion, EDB reductions were >97% in the shallow wells; four wells exhibited a two log reduction (>99%), and two of the wells exhibiting three-log reductions (>99.9%). EDB degradation was evident through comparison with benzene and toluene concentrations, and the production of EDB degradation products ethene, ethane, and bromide suggested that the degradation occurred by reductive debromination. https://www.env.nm.gov/wp-content/uploads/2019/04/KAFB-in-situ-biodegradation-report-April-2019.pdf

BOREHOLE-SCALE TESTING OF MATRIX DIFFUSION FOR CONTAMINATED-ROCK AQUIFERS
Harte, P.T. and W.C. Brandon. | Remediation 30(2):37-53(2020)

A newly developed method assesses the effect of matrix diffusion on contaminant transport and remediation of groundwater in fractured rock. The method utilizes open-borehole monitoring wells in fractured rock to conduct backward diffusion experiments on CVOCs in groundwater. Testing was performed on relatively unfractured zones over short intervals in open boreholes at the former Pease Air Force Base in Portsmouth, New Hampshire to investigate back diffusion of cis-1,2-DCE. Post-sparging concentrations of cis-1,2-DCE showed initial rebounding followed by declines, excluding an episodic spike in concentrations from a groundwater recharge event. Three processes were theorized to control concentration responses in the test zones post-sparging: 1) the limited back diffusion of CVOCs from a halo or thin zone of rock around the borehole contributes to the initial rebounding; 2) aerobic degradation of cis-1,2-DCE occurred causing declines in concentrations in the test zone; and 3) microflow from microfractures contributed to the episodic spike in concentrations following the groundwater recharge event. In active flow zones, the latter two processes are not measurable due to equilibration from groundwater transport between the borehole and active flowing fractures.

PILOT-SCALE ELECTRO-BIOREMEDIATION OF HEAVILY PAH-CONTAMINATED SOIL FROM AN ABANDONED COKING PLANT SITE
Li, F., S. Guo, B. Wu, and S. Wang. | Chemosphere 244:125467(2020)

A 182-day pilot study was conducted at Shenyang former Coking Plant in China to remove PAHs (total PAHs of 5,635.6 mg/kg) from the soil using three treatments: control treatment (without inoculation or electric field), bioremediation with inoculation, and electro-bioremediation with inoculation and electric field. Treatments were conducted from May to October under natural conditions. Results show that electro-bioremediation enhanced the removal of PAHs, especially high-ring (>3 rings) PAHs. At 182 days, the degradation extents of total PAH reached 69.1% and 4-6-ring PAHs reached 65.9% (29.3% and 44.4% higher, respectively, than those under bioremediation alone). After electro-bioremediation, the total toxicity equivalent concentrations also were reduced. Electro-bioremediation effectively removed PAHs and reduced the health risks of soil at the site. Also, electro-bioremediation with polarity reversal could maintain uniform soil pH, the degradation extent of PAHs, and soil microorganism numbers at all sites. The environmental conditions, such as temperature and rainfall, had little influence on the process of electro-bioremediation.

FIELD-SCALE BIOREMEDIATION OF ARSENIC-CONTAMINATED GROUNDWATER USING SULFATE-REDUCING BACTERIA AND BIOGENIC PYRITE
Lee, M.-K., J.A. Saunders, T. Wilson, E. Levitt, S.S. Ghandehari, P. Dhakal, J. Redwine, et al.
Bioremediation 23(1):1-21(2019)

Biogenic pyrite formed by stimulating indigenous sulfate-reducing bacteria (SRB) in a natural aquifer removed dissolved arsenic from contaminated under strongly reducing conditions. Biodegradable organic carbon, ferrous iron, sulfate, and fertilizer were injected into groundwater to stimulate SRB metabolism, which began ~1 week later. Microscopic, X-ray diffraction, X-ray fluorescence, and electron microprobe analyses confirm the bio-mineralization of pyrite and over time, pyrite nanoparticles grew to form well-formed crystals (1-10 µm in diameter) or spherical aggregates that contain 0.05-0.4 wt.% arsenic. Dissolved arsenic decreased from 0.3-0.5 mg/L to 90% and lasted for 6 months until the upgradient groundwater mixed with the aquifer. Groundwater with the most active bacterial sulfate reduction became enriched in ^{34}S (2.02-4.00‰) compared to unaffected well water (0.40-0.61‰). One to three orders of magnitude increases in SRB cells were observed in treated wells for at least 2 months after injection. For full-scale remediation, the injection of the solution should start at positions hydrologically upgradient from the major plume and proceed downgradient. If needed, aquifers may be repeatedly amended with biodegradable organic carbon to reestablish the reducing conditions that favor arsenic sequestration.

Research

PROOF-OF-CONCEPT FOR THE IN SITU TOXICITY IDENTIFICATION EVALUATION (ITIE) TECHNOLOGY FOR ASSESSING CONTAMINATED SEDIMENTS, REMEDIATION SUCCESS, RECONTAMINATION, AND SOURCE IDENTIFICATION
Burton, Jr., G.A. SERDP Project ER18-1181, 45pp, 2019

The iTIES prototype 3 is a robust deployable system that allows for consistent and sensitive adjustments to pumping rates of ambient waters through the diagnostic array of resin treatments. The current battery of resins separates the following potential toxicants: ammonia, problematic heavy metals, and organics of various characteristics, including PFAS. A study was conducted to provide proof-of-concept of an accurate field methodology for in situ assessment that linked chemical class exposures to effects, allowing for more cost-effective monitoring and remediation decisions. Advantages of the system were higher sensitivity at detecting ambient toxicity than the traditional laboratory-based toxicity identification evaluation (TIE), fewer required resources for experiments, and a unique diagnostic tool for use in a tiered risk assessment. A resource evaluation conducted on the traditional EPA Phase 1 TIE and the iTIES determined that the iTIES required 47% less time based on staff time required for each task. The iTIE is more sensitive at detecting toxicity than the laboratory-based TIE. https://www.serdp-estcp.org/content/download/50675/498021/file/ER18-1181%20Final%20Report.pdf

REMEDIATING POTENTIALLY TOXIC METAL AND ORGANIC CO-CONTAMINATION OF SOIL BY COMBINING IN SITU SOLIDIFICATION/STABILIZATION AND CHEMICAL OXIDATION: EFFICACY, MECHANISM, AND EVALUATION
Ma, Y. Z. Liu, Y. Xu, S. Zhou, Y. Wu, J. Wang, Z. Huang, and Y. Shi.
International Journal of Environmental Research and Public Health 15(11):2595(2018)

In situ solidification/stabilization (ISS) and in situ chemical oxidation (ISCO) were combined to simultaneously remove aniline (1000 mg/kg) and Cd (10 mg/kg) from soil. All four ISS amendments, especially quick lime (CaO) and Portland cement, promoted ISCO with persulfate. ISS/ISCO removed aniline and reduced the bioavailable Cd content at initial persulfate and ISS amendment concentrations of 1.08 mol/kg and 30 wt% with a seven-day curing time and significantly

reduced leaching. However, ISS/ISCO did not synergistically remediate Cd in co-contaminated soil. Strong alkalinity and high temperature caused by a chemical reaction between CaO and water were the main mechanisms driving rapid pollutant removal and immobilization. The relative contributions of heat vs. alkaline activation, as well as the contaminant removal efficiency, increased with ISS amendment CaO content. Combined treatment altered the soil physicochemical properties, and significantly increased Ca and S contents. Activated persulfate-related reactions did not negatively impact unconfined compressive strength and hydraulic conductivity. *This paper is* ***Open Access*** *at* https://www.mdpi.com/1660-4601/15/11/2595/htm.

LEACHING AND TRANSPORT OF PFAS FROM AQUEOUS FILM-FORMING FOAM (AFFF) IN THE UNSATURATED SOIL AT A FIREFIGHTING TRAINING FACILITY UNDER COLD CLIMATIC CONDITIONS

Hoisaeter, A., A. Pfaff, and G.D. Breedveld.
Journal of Contaminant Hydrology 222:112-122(2019)

Column studies were performed to measure the leaching and transport of PFOS in unsaturated soils at a Norwegian former firefighting training facility 15 years after aqueous film-forming foam (AFFF) use had ceased. PFOS accounted for 96% of the total PFAS concentration in site soil with concentrations ranging from

BIOREMEDIATION TO TREAT THE WORLD'S WORST EVER RECORDED OIL CONTAMINATION CASE

Alsulaili, A., W. Alkhamees, S. Alghurbah, A. Almershed, and S. Alrashdan.
Proceedings of the 5th World Congress on New Technologies (NewTech'19), Lisbon, Portugal, 18-20 August, 12 pp, 2019

Burning oil wells during the 1990 Gulf War polluted the soil in Kuwait. The bioremediation technology "vermi-remediation" was chosen to treat the oil-contaminated soil using earthworms. The objective was to conduct a series of experiments to determine whether the technique was effective in treating Kuwait's soil and to what extent. Treatment results were found to surpass the results of currently implemented remediation methods by reducing both contamination and time of treatment. The system was found to treat up to 62% of TPHs in highly oil-contaminated soil samples, 55% for medium oil-contaminated soil samples and 71% for low oil-contaminated soil samples within three weeks.
https://avestia.com/NewTech2019_Proceedings/files/paper/ICEPR/ICEPR_154.pdf

REMEDIATION OF PETROLEUM IMPACTED SOILS WITH ELECTRON BEAM IRRADIATION

Lassalle, J., R. Rodi, K. Briggs, D. Staack, J.M. Walker, A. Strzelec, T.P. Hoelen, P. Bireta, D. Kong, et al.
26th International Petroleum Environmental Conference, 7-9 October, San Antonio, TX, 24 slides, 2019

Building on results demonstrating the efficacy of electron beam irradiation as a remediation technology, additional experiments and simulations were performed to prepare the technology for field application. These experiments focused on the development of soil handling systems and the optimization of treatment parameters. The presentation includes an overview of the technology, the experimental setup, and results.
https://cese.utulsa.edu/wp-content/uploads/2019/11/IPEC-2019-J.-Lasalle-Remediation-Presentation.pdf

BIOLOGICALLY MEDIATED ABIOTIC DEGRADATION (BMAD) OF CHLORINATED ETHENES: A NEW CONCEPTUAL FRAMEWORK

Scherer, M.M, D.E. Latta, A. Neumann, D.M. Cwiertny, and R. Deeb. SERDP Project ER-2532, 111 pp, 2019

This project's primary objective was to evaluate whether magnetite and Fe-containing clay minerals reduced PCE and TCE alone and in the presence of ferrous iron (Fe(II)) or sulfide (S(-II)), evaluate pathways and factors controlling abiotic degradation of PCE and TCE by reactive minerals, and evaluate which aquifer properties might be used as indicators for abiotic natural attenuation rates in anoxic PCE and TCE plumes. Magnetite and reduced Fe-containing clay minerals alone did not reduce PCE and TCE under anoxic conditions. No reduction of PCE and TCE were observed when sulfide was added to magnetite and clay mineral suspensions. Both magnetite and Fe-containing clay minerals reduced PCE and TCE to acetylene in the presence of high concentrations of Fe(II). In both cases, analyses indicated a transient mineral phase formed suggesting that dynamic conditions and high Fe(II) concentrations that favor active precipitation of minerals could abiotically attenuate anoxic PCE and TCE plumes.
https://www.serdp-estcp.org/content/download/50676/498031/file/ER-2532%20Final%20Report.pdf

REMEDIATION OF PYRENE CONTAMINATED SOIL BY DOUBLE DIELECTRIC BARRIER DISCHARGE PLASMA TECHNOLOGY: PERFORMANCE OPTIMIZATION AND EVALUATION

Abbas, Y., W. Lu, Q. Wang, H. Dai, Y. Liu, X. Fu, C. Pan, H. Ghaedi, F. Cheng, and H. Wang.
Environmental Pollution 260:113944(2020)

A double dielectric barrier discharge (DDBD) plasma reactor was optimized with influential parameters including applied voltage, type of carrier gas, air feeding rate and initial pyrene concentrations in contaminated soil. Input energy was found to have a great effect on pyrene remediation efficiency followed by pyrene initial concentration. The effect of air feeding rate was insignificant. The remediation efficiency of pyrene under air, nitrogen, and argon as carrier gas were approximately 79.7, 40.7 and 38.2% respectively. Pyrene remediation efficiency was favored at high levels of applied voltages and low levels of pyrene initial concentration (10 mg/kg) and air feeding rate (0.85 L/min). Computing the system's energy efficiency showed that an optimal applied voltage (35.8 kV) and higher initial pyrene concentration (200 mg/kg) favored high energy efficiency. A regression model predicting pyrene remediation under DDBD plasma condition was developed using the data from a face-centered central composite design experiment. A residual toxicity analysis depicted that the respiratory activity increased more than 21 times (from 0.04 to 0.849 mg O 2/g) with a pyrene remediation efficiency of 81.1%.

General News

NANOTECHNOLOGY IN REMEDIATION OF WATER CONTAMINATED BY POLY- AND PERFLUOROALKYL SUBSTANCES: A REVIEW

Zhang, W., D. Zhang, and Y. Liang.
Environmental Pollution 247:266-276(2019)

Literature has shown that PFOA can be effectively decomposed in the presence of either TiO2-based, Ga2O3-based, or In_2O_3 -based nano-photocatalysts under ultraviolet irradiation. This article reviews and compares the decomposition abilities and mechanisms of different nano-photocatalysts. Nano-sized In_2O_3 photocatalysts were found to have the best potential in PFOA decomposition and the decomposition performance is closely related to the specific surface area and the number of photogenerated holes on the surfaces of In_2O_3 nanostructures. In addition to a detailed review of the published studies, future prospects of using nanotechnology for PFAS remediation are also discussed.

MICROBIAL FUEL CELL SYSTEM: A PROMISING TECHNOLOGY FOR POLLUTANT REMOVAL AND ENVIRONMENTAL REMEDIATION

Wu, Q., S. Jiao, M. Ma, and S. Peng.
Environmental Science and Pollution Research 27:6749-6764(2020)

The microbial fuel cell (MFC) system, a promising environmental remediation technology, has a simple compact design, low cost, and converts chemical energy from waste matter to electrical energy. In this review, research was gathered on the use of MFC system technologies for pollutant removal and environmental remediation. The review includes an introduction of the main configurations and pollutant removal mechanism by MFCs; research progress of MFC systems, including wastewater treatment, soil remediation, natural water, and groundwater remediation, sludge and solid waste treatment, and greenhouse gas emission control; application of MFCs in environmental monitoring; and the combination of MFCs with other technologies. Current limitations and potential future research recommendations are discussed.

RESEARCH ON PROGRESS IN COMBINED REMEDIATION TECHNOLOGIES OF HEAVY METAL POLLUTED SEDIMENT

Zhang, M., X. Wang, L. Yang, and Y. Chu.
International Journal of Environmental Research and Public Health 16:5098(2019)

Combined remediation technologies have attracted widespread attention for their unique advantages to remediate heavy metals in sediments. This article introduces combined remediation technologies based on physical-, chemical-, and bio-remediation of heavy metal polluted sediments. It summarizes research progress in physical-chemical, bio-chemical, and inter-organism (including plants, animals, microorganisms) remediation of heavy metal polluted sediments. It also analyzes problems of the process of combined remediation of heavy metals in river sediments and outlooks the future development trends of remediation technologies. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6950138/pdf/ijerph-16-05098.pdf

THE APPLICATION OF THREE NEW TECHNOLOGIES IN WATER REMEDIATION: TAKING PEARL RIVER DELTA AS AN ANALYSIS SAMPLE

Lu, W. | IOP Conference Series: Earth and Environmental Science 330: 032001(2019)

This article introduces three cutting-edge methods for water remediation: nanofibrous membrane, biofiltration, and electrodialysis. Advantages and disadvantages are discussed and suggestions are given as to how to apply the technologies to the Pearl River Delta in China, which is contaminated with industrial wastewater and living sewage. https://iopscience.iop.org/article/10.1088/1755-1315/330/3/032001/pdf

THEORY AND MODELLING APPROACHES TO PASSIVE SAMPLING

Salim, F. and T. Gorecki. | Environmental Science: Processes & Impacts 21:1618-1641(2019)

This review describes passive sampling theory and modeling approaches presented in the literature in a manner that allows researchers to understand them and to recognize the assumptions behind each approach together with their applicability to a given passive sampling technique. The review also presents empirically calibrated models in an attempt to simplify the process of passive sampling rate determination.

BAMBOO - AN UNTAPPED PLANT RESOURCE FOR THE PHYTOREMEDIATION OF HEAVY METAL CONTAMINATED SOILS

Bian, F., Z. Zhong, X. Zhang, C. Yang, and X. Gai.
Chemosphere 246:125750(2020)

Although there are limited studies on bamboo for phytoremediation, recent studies have shown that some bamboo species have a high ability to adapt to metalliferous environments and a high capacity to absorb heavy metals. However, excessive concentrations of heavy metals may cause oxidative stress and damage bamboo plants. Several management strategies have been developed to improve bamboo's phytoremediation ability, including selecting tolerant bamboo species, intercropping with hyperaccumulators, fertilization applications, and employment of chelate in soil. This review demonstrates that bamboo species, which have high biomass productivity, short rotation, and high economic value, can be used for phytoremediation. Mechanisms of heavy metal uptake, transport, sequestration, and detoxification of different bamboo species require further investigation.

MICROBIAL REMEDIATION APPROACHES FOR EXPLOSIVE CONTAMINATED SOIL: CRITICAL ASSESSMENT OF AVAILABLE TECHNOLOGIES, RECENT INNOVATIONS AND FUTURE PROSPECTS

Kalsi, A., S.M. Celin, P. Bhanot, S. Sahai, and J.G. Sharma.
Environmental Technology & Innovation 18:100721(2020)

This review critically assesses the various in situ and ex situ microbial treatment technologies to remediate explosive-contaminated soil, discusses the technologies' environmental impact along with the various emerging trends in the field of microbial remediation in the past decade, and explores the prospects of microbial remediation that can provide a sustainable solution for soil explosive contamination.

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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.

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