

# Technology Innovation News Survey

## Entries for March 1-15, 2016

### Market/Commercialization Information

#### UNRESTRICTED PRE-PLACED REMEDIAL ACTION CONTRACT: IDIQ MULTIPLE AWARD TASK ORDER CONTRACT (MATOC)

U.S. Army Corps of Engineers, USACE District, Kansas City, Missouri.  
Federal Business Opportunities, FBO-5135, Solicitation W912DQ-16-R-3001, 2016

The forthcoming Preplaced Remedial Action Contract will support work assigned to the USACE Northwestern Division and EPA Region 2 for hazardous, toxic, and radioactive waste remediation projects for both civilian and military agencies of the federal government. This environmental response action contract will include service and construction activities. The majority of the work likely will be conducted within EPA Region 2. The MATOC will provide \$92.5M in shared capacity for up to five contractors and will be available for award to firms with active SAM registration under NAICS code 562910. Firm-fixed-price or cost-reimbursement task orders will be written against the IDIQ contracts, which will have a base period of three years and a two-year option. Release of the solicitation is anticipated after mid April 2016. <https://www.fbo.gov/spg/USA/COE/DACA41/W912DQ-16-R-3001/listing.html>

#### INDEFINITE DELIVERY CONTRACT FOR ENVIRONMENTAL SUPPORT SERVICES, PRIMARILY VARIOUS LOCATIONS, ALASKA

U.S. Army Corps of Engineers, USACE District, Alaska, JBER, Alaska.  
Federal Business Opportunities, FBO-5252, Solicitation W911KB-16-R-0035-SS, 2016

This announcement constitutes market research to facilitate a determination of acquisition strategy for a potential indefinite delivery contract with a capacity of less than \$50M. The contractor is to provide environmental conservation, compliance, pollution prevention, and operations and maintenance support on behalf of USACE customers within the Pacific Ocean Division area of responsibility (mainly Alaska). Interested vendors are invited to submit a capability statement (3 pages or less) via email by 2:00 PM Alaska Time, May 9, 2016 <https://www.fbo.gov/spg/USA/COE/DACA85/W911KB-16-R-0035-SS/listing.html>

#### TREECE SUBSITE, OU-4, CHEROKEE COUNTY, KS

U.S. EPA, Office of Acquisition Management, Region VII, Lenexa, KS.  
Federal Business Opportunities, FBO-5249, SOL-R7-16-00007, 2016

This solicitation will be a 100% small business set-aside under NAICS 562910. Release of the RFP is anticipated during the 3rd quarter of FY2016. The requirement is for the performance of a remedial action for a portion of the mine waste located at the Treece subsite, Operable Unit 4, of the Cherokee County Superfund site. The Treece OU-4 subsite covers ~1.5 sq miles and has been subdivided into 5 stages for design and remediation purposes. EPA anticipates issuing a Requirements contract with fixed unit prices consisting of a one-year base period and two one-year options. Estimated dollar value for this procurement is between \$12M to \$14M. Details of this future procurement will be posted on FedConnect at <https://www.fedconnect.net/FedConnect/?doc=SOL-R7-16-00007&agency=EPA> [Note: It might be necessary to copy and paste the URL into your browser for direct access.] <https://www.fbo.gov/spg/EPA/OAM/ReqVII/SOL-R7-16-00007/listing.html>

### Cleanup News

#### THE BIOGEOCHEMICAL REDUCTIVE DEHALOGENATION GROUNDWATER TREATMENT PROCESS: COMMERCIALIZATION STATUS AT BENCH, PILOT AND FULL SCALE

Studer, J.E.  
Abstracts of the 21st Annual Florida Remediation Conference, Orlando, October 8-9, 2015

A novel in situ remediation technology that combines biological and abiotic processes has been commercialized as the BiRD biogeochemical reductive dehalogenation treatment process. The technology generates amorphous and crystalline forms of iron sulfide (referred to as FexSy) in situ, which can dehalogenate compounds such as PCE, TCE, and other chlorinated aliphatics at significant rates. The FexSy reactive zone is created rapidly and can treat passing groundwater over a relatively long period of time. The process can be applied via direct injection or trenching techniques using inexpensive nontoxic reactants that are readily available in either liquid or solid form. The technology is compatible with enhanced bioremediation and zero-valent iron treatments. For additional information on this technology, see the compilation of technical information and case studies at [http://www.swrcb.ca.gov/losangeles/board\\_decisions/adopted\\_orders/WDR\\_Update/Calciumhydroxide,magnesiumhydroxide,hematite-WDREvaluation.pdf](http://www.swrcb.ca.gov/losangeles/board_decisions/adopted_orders/WDR_Update/Calciumhydroxide,magnesiumhydroxide,hematite-WDREvaluation.pdf).

#### FULL-SCALE ELECTROKINETICALLY ENHANCED BIOREMEDIATION (EK-BIO™) OF PCE DNAPL IN CLAY: RESULTS FROM YEAR 1

Cox, E.  
RemTEC Summit, 1-4 March 2015, Westminster, CO. 26 slides, 2015

A field pilot test was carried out in 2011 at the Skuldelev site, Denmark, to assess the ability of the novel EK-BIO™ technology to treat PCE DNAPL source material in interbedded deposits of sand and clay till. The pilot demonstrated that EK can facilitate the transport of amendments (lactate and microbial culture KB-1™) through clay soils. Results from groundwater sampling and clay soil coring showed significant reductive dechlorination of PCE to cisDCE, VC, and ethane, plus significant levels of dechlorinating microorganisms. Full-scale implementation of EK-BIO at the Skuldelev site was initiated in December 2012. The treatment zone, addressed by a network of 15 electrode wells, covers an area of 100 m<sup>2</sup> to a maximum depth of 10 m bgs. Each half of the area is treated alternately for a period of three months. Electrodes polarity is changed to alter the current directions in alternating stages to optimize the electroosmotic flow and achieve treatment of the entire contaminated volume. Results from the first full cycle of operation (4 stages of 3 months each) show significant conversion of PCE to ethene, increases of *Dehalococcoides* and *vcrA* at several orders of magnitude, and increases in chloride. Soil results mirror the groundwater results. EK-BIO for the Skuldelev site is expected to operate for 3 to 5 years; after the first 18 months of operation, progress appears to be on and even ahead of schedule. <http://www.remtecsummit.com/images/presentations/Evan%20Cox.pdf>

### Demonstrations / Feasibility Studies

#### OPTIMAL TREATMENT ZONE MOVES DURING ENHANCED REDUCTIVE DECHLORINATION IN FRACTURED BEDROCK

Hentery, R.W. and W.D. Harms.  
Remediation Journal, Vol 25 No 4, 81-88, 2015

A bioremediation pilot test was implemented to study the efficacy of enhancing in situ reductive dechlorination of PCE in shallow bedrock where some intrinsic degradation to cis-1,2-DCE was observed without further degradation to VC or nontoxic ethene. Limited *Dehalococcoides* spp. (dhc) cell concentrations were present within the study area prior to the gravity-fed injection of fermentable carbon substrates in native anaerobic groundwater. Direct connectivity between the injection well screen and performance monitoring well resulted in the degradation of nearly all PCE to cis-1,2-DCE, significant decrease in pH, and apparent inhibited dhc growth in the study area groundwater in the first six months. After 24 months, nearly all cis-1,2-DCE was degraded to nontoxic ethene, pH rebounded to more optimal levels, and abundant growth of dhc and its functional gene expressions was evident. Results demonstrated that initial poor dechlorination within the injection zone did not preclude effective treatment. Monitoring over a period of two years showed that the effective treatment zone (or more-optimal fringe) first moved outward from the injection zone beyond the monitoring point and then receded back toward the point of injection.

#### COUPLING BIOFLOCCULATION OF DEHALOCOCCOIDES TO HIGH DECHLORINATION RATES FOR EX SITU AND IN SITU BIOREMEDIATION

Fajardo-Williams, Devyn, Master's thesis, Arizona State University, 39 pp, 2015

Work with upflow continuous bioreactors has shown that high-performance, fast-rate dechlorination of TCE can be achieved by promoting bioflocculation of cultures containing *Dehalococcoides mccartyi*. Successful operation of a pilot-scale bioreactor led to the assessment of the technology as an on-site ex situ treatment system. The bioreactor was fed TCE-contaminated groundwater from the Motorola Inc. 52nd Street Plant Superfund site in Phoenix, and augmented with the fermentable substrates lactate and methanol. The bioreactor achieved high maximum conversion rates of  $0.47 \pm 0.01$  mmol Cl<sup>-</sup>/culture/h at an HRT of 3.2 hours with >99% dechlorination of TCE to ethene. These rates exceed those documented for commercially available dechlorinating cultures. <https://repository.asu.edu/items/34923>

#### ASSESSMENT OF OPTIMUM WIDTH AND LONGEVITY OF A PERMEABLE REACTIVE BARRIER INSTALLED IN AN ACID SULFATE SOIL TERRAIN

Pathirage, U. and B. Indraratna.  
Canadian Geotechnical Journal, Vol 52 No 7, 999-1004, 2015

Field monitoring and geochemical modeling were conducted for a trial permeable reactive barrier (PRB) located in the Shoalhaven Floodplain, south of Wollongong, Australia. The optimum PRB width was evaluated numerically, based on neutralization effectiveness when acidic groundwater travels through the alkaline PRB. A previously developed model was extended to consider the residence time, reaction kinetics, mineral precipitation-induced reduction in porosity and hydraulic conductivity, influent concentrations of the contaminants, and groundwater flow velocity. PRB longevity was determined with respect to groundwater flow rates and amount of reactive material consumed. Additional information: <http://www.sci-en-tech.com/ICCM2014/PDFs/191-1183-1-PB.pdf>

#### **OW-5/55R AREA IN-SITU GEOCHEMICAL STABILIZATION REMEDIATION PERFORMANCE EVALUATION, FORMER KOPPERS WOOD TREATING PLANT, NASHUA, NEW HAMPSHIRE**

New Hampshire Department of Environmental Services, 106 pp, 2015

In November 2014, in situ geochemical stabilization (ISGS) reagent injections were performed in the OW-5/55R area, targeting previously identified zones of subsurface creosote NAPL. Targeted injection depths were determined by the Environmental Visualization System (EVS) model generated during characterization. The EVS model is a statistical distribution of the subsurface NAPL developed based on the logs recorded during characterization. EVS represents the best available tool for evaluation of the extent and depths of NAPL seams in the pilot-test area. Direct-push injections were performed with a Geoprobe® rig. The direct-push injection points were initially established based on a 15-ft triangular grid pattern throughout the pilot-test area. The field locations of injection points were adjusted based on rig access and the locations of large trees, keeping the injection locations as close as possible to the proposed locations. The majority of the injection intervals were performed at depths between 25-35 ft bgs. Full-scale implementation will be designed based on the procedures and approaches documented in the successful 2014 pilot test.

[https://clu-in.org/download/contaminantfocus/dnapl/treatment\\_technologies/Koppers-NH-ISGS-2015.pdf](https://clu-in.org/download/contaminantfocus/dnapl/treatment_technologies/Koppers-NH-ISGS-2015.pdf)

#### **PRE-FINAL DESIGN FOR FORMER PROCESS AREA IN-SITU GEOCHEMICAL STABILIZATION REMEDIATION, FORMER CABOT CARBON/KOPPERS INC. SITE, GAINESVILLE, FLORIDA**

Alachua County Environmental Protection Department, Florida. 844 pp, 2015

This report documents the successful implementation of a pilot test to remediate subsurface DNAPLs (creosote) at the former Koppers Inc. portion of the Cabot Carbon/Koppers Superfund Site in Gainesville, Florida. Included with this report is the proposed design and implementation of the full-scale in situ geochemical stabilization (ISGS) treatment of the former Process Area. The ISGS remediation technology consists of a permanganate-based reagent (RemOx® EC) that is injected into DNAPL-impacted zones. Section 2.0 of this report presents the ISGS pilot-test implementation approach and results. Section 3.0 describes the Pre-Final Design for full-scale ISGS implementation in the former Process Area.

[https://clu-in.org/download/contaminantfocus/dnapl/treatment\\_technologies/KoppersFL-isgsdesign-2015.pdf](https://clu-in.org/download/contaminantfocus/dnapl/treatment_technologies/KoppersFL-isgsdesign-2015.pdf)-- See also the plan to field-test an organoclay amendment to the ISGS injectant: [https://clu-in.org/download/contaminantfocus/dnapl/treatment\\_technologies/KoppersFL-organoclay-ISGS-2015.pdf](https://clu-in.org/download/contaminantfocus/dnapl/treatment_technologies/KoppersFL-organoclay-ISGS-2015.pdf)

## **Research**

#### **DENSE NONAQUEOUS-PHASE LIQUID ARCHITECTURE IN FRACTURED BEDROCK: IMPLICATIONS FOR TREATMENT AND PLUME LONGEVITY**

Schaefer, C.E., E.B. White, G.M. Lavorgna, and M.D. Annable.  
Environmental Science & Technology, Vol 50 No 1, 207-213, 2016

Partitioning tracer testing was performed in discrete intervals within a fractured bedrock PCE DNAPL source area to assess the fracture flow field and DNAPL architecture. Results confirmed that partitioning tracer testing was able to identify and quantify low levels of residual DNAPL along flow paths in hydraulically conductive fractures. DNAPL fracture saturations (S<sub>n</sub>) ranged from undetectable to 0.007 (DNAPL volume/fracture volume). A comparison of the fracture flow field to the DNAPL distribution indicated that the highest value of S<sub>n</sub> was observed in the least transmissive fracture (or fracture zone). Application of a simple ambient dissolution model showed that the DNAPL present in this low transmissivity zone would persist longer than the DNAPL present in more transmissive fractures and (in the absence of any degradation reactions) would persist for 200 years. Assessment of PCE mass distribution between the rock matrix and fractures showed that, due to the presence of DNAPL, the rock matrix accounted for less than 10% of the total PCE mass. Evaluation of PCE concentration profiles in the rock matrix and estimated diffusional flux from the rock matrix suggests that the elevated PCE groundwater concentrations observed in the fractures likely are derived from residual DNAPL sources and that removal of the residual DNAPL sources within the fractures would result in a significant decrease in dissolved PCE concentrations in the source area.

#### **BIOLOGICALLY ENHANCED DENSE NON-AQUEOUS PHASE LIQUID DISSOLUTION IN A THREE-DIMENSIONAL SANDSTONE FRACTURE NETWORK**

Altman, Peggy Whitney, Master's thesis, Colorado School of Mines, 62 pp, 2015

In an investigation of the role of fracture aperture variability in the effectiveness of PCE biodegradation, observed solvent dissolution enhancement ranged from 2.1 to 3.2, which is roughly a factor of 2 higher than single-fracture experiments of the same rock type in less than half the time frame. Fracture intersections create more turbulent mixing and dispersion compared to a single fracture, which allows for more efficient delivery of dissolved-phase PCE to dechlorinators. Results suggest that the natural flow heterogeneity found within bedrock fracture networks provides an ideal environment for segregating DNAPL-water interface and dechlorinating microbes, thus benefitting biologically enhanced solvent dissolution.

[https://dspace.library.colostate.edu/bitstream/handle/11124/166672/Altman\\_mines\\_0052N\\_10878.pdf?sequence=1](https://dspace.library.colostate.edu/bitstream/handle/11124/166672/Altman_mines_0052N_10878.pdf?sequence=1)

#### **IN SITU FIXATION OF METAL(LOID)S IN CONTAMINATED SOILS: A COMPARISON OF CONVENTIONAL, OPPORTUNISTIC, AND ENGINEERED SOIL AMENDMENTS**

Mele, E., E. Donner, A.L. Juhasz, G. Brunetti, E. Smith, A.R. Betts, P. Castaldi, et al.  
Environmental Science & Technology, Vol 49 No 22, 13501-13509, 2015

Some traditional remediation materials, such as phosphate, are particularly useful for immobilizing metal cations and Pb in particular, but in soil contaminated by both metals and As, phosphate may induce As mobilization through exchange reactions. A study was conducted to evaluate the ability of a range of amendments added to a metal(loid)-contaminated soil to decrease the associated risks to human health and the environment. Pb and As bioaccessibility in a mining soil was compared pre- and post-amendment with conventional (phosphate), opportunistic (water treatment residuals), and engineered (zero-valent iron) remediation products. Pb relative bioavailability was investigated in the treated and untreated soil using an in vivo mouse model, and As speciation before and after treatment was assessed using X-ray absorption near-edge spectroscopy to elucidate the specific mechanisms underlying the observed reductions in bioaccessibility.

#### **EVALUATION OF BIOAVAILABLE ARSENIC AND REMEDIATION PERFORMANCE USING A WHOLE-CELL BIOREPORTER**

Yoon, Y., S. Kim, Y. Chae, S.W. Jeong, and Y.J. An.  
Science of the Total Environment, Vol 547, 125-131, 2016

A novel strategy is reported for testing arsenic (As) bioavailability in soil samples by direct (in vivo) and indirect (in vitro) measurement using an *Escherichia coli*-based whole-cell bioreporter (WCB). To evaluate the efficiency of bioavailable As removal, the WCB was used to test As-amended soils and field soils collected from a smelter area under remediation. The percentage of bioavailable As in amended and field soils was 5.8% (4.9%-7.6%) and 0.6% (0.08%-1.09%) of total As, respectively. In the contaminated soils following soil washing, total As fell while bioavailable As increased slightly. These results emphasize the importance of considering ecotoxicological aspects of soil remediation by assessing bioavailability along with the total amount of contaminant present.

#### **EMERGING TECHNOLOGIES FOR ENVIRONMENTAL REMEDIATION: INTEGRATING DATA AND JUDGMENT**

Bates, M.E., K.D. Grieger, B.D. Trump, J.M. Keisler, K.J. Plourde, and I. Linkov.  
Environmental Science & Technology, Vol 50 No 1, 349-358, 2016

Multi-criteria decision analysis (MCDA) can support early decisions for emerging technologies when data are too sparse or uncertain for traditional risk assessment. MCDA does this by integrating expert judgment with available quantitative and qualitative inputs across multiple criteria to provide relative technology scores. An MCDA framework was used to provide preliminary insights on the suitability of emerging technologies for environmental remediation by comparing nanotechnology and synthetic biology to conventional remediation methods. Subject-matter experts provided judgments regarding the importance of criteria used in the evaluations and scored the technologies with respect to those criteria. Results indicate that synthetic biology may be preferred over nanotechnology and conventional methods for high expected benefits and low deployment costs, but conventional technology may be preferred over emerging technologies for reduced risks and development costs. In the absence of field data regarding the risks, benefits, and costs of emerging technologies, structuring evidence-based expert judgment through a weighted hierarchy of topical questions may be helpful to inform preliminary risk governance and guide emerging technology development and policy.

#### **ASSESSMENT OF WASTE OYSTER SHELLS AND COAL MINE DRAINAGE SLUDGE FOR THE STABILIZATION OF AS-, PB-, AND CU-CONTAMINATED SOIL**

Moore, D.H., K.H. Cheong, A. Koutsospyros, Y.-Y. Chang, S. Hyun, Y.S. Ok, and J.-H. Park.  
Environmental Science and Pollution Research, Vol 23 No 3, 2362-2370, 2016

For simultaneous immobilization of As, Cu, and Pb in contaminated soils, treatments were conducted using standard U.S. sieve size no. 20 (0.85 mm) calcined oyster shells (COS) and coal mine drainage sludge (CMDS) materials with a curing time of 1 and 28 days. Results showed that As, Cu, and Pb immobilization was best achieved using a mix of 10 wt% COS and 10 wt% CMDS, which demonstrated superior leachability reductions for all three target contaminants (>93% As and >99% Cu and Pb) over a curing period of 28 days. Arsenic was present in the form of As(V) in the control sample, and no changes in As speciation were observed following the COS-CMDS treatments. Arsenic immobilization may be associated with the formation of Ca-As and Fe-As precipitates, while Pb and Cu immobilization likely was linked to calcium silicate hydrates and calcium aluminum hydrates.

#### A USER-FRIENDLY PHYTOREMEDIATION DATABASE: CREATING THE SEARCHABLE DATABASE, THE USERS, AND THE BROADER IMPLICATIONS

Famulari, S. and K. Witz.  
International Journal of Phytoremediation, Vol 17 No 8, 737-744, 2015

This paper discusses the creation of a phytoremediation database developed for designers, students, teachers, gardeners, farmers, landscape architects, engineers, and others who have interest in or uses for plant-based remediation. The database is designed for ease of use for a non-scientific user, as well as for students in an educational setting. The contents comprise a record of research of plant species that aid in the uptake of contaminants, including metals, organic materials, biodiesels and oils, and radionuclides. Multiple interconnected indexes are categorized into common and scientific plant name, contaminant name, and contaminant type. The records include photographs, hardness zones, specific plant qualities, full citations to the original research, and other relevant information intended to help searchers identify potential plants for site-specific needs. A terminology section is designed to remove uncertainty for less experienced users. The database currently is available at <http://www.steviefamulari.net/phytoremediation>.

#### MICROBIAL TRANSFORMATION OF 8:2 FLUOROTELOMER ACRYLATE AND METHACRYLATE IN AEROBIC SOILS

Royer, L.A., L.S. Lee, M.H. Russell, L.F. Nies, and R.F. Turco.  
Chemosphere, Vol 129, 54-61, 2015

Biotransformation of fluorotelomer (FT) compounds, such as 8:2 FT alcohol (FTOH), is recognized as a source of perfluorooctanoic acid (PFOA) as well as other perfluoroalkyl acids. In this study, microbially mediated hydrolysis of FT industrial intermediates 8:2 FT acrylate (8:2 FTAC) and 8:2 FT methacrylate (8:2 FTMAC) was evaluated in aerobic soils for up to 105 d. At designated times, triplicate microcosms were sacrificed by sampling the headspace for volatile FTOHs followed by sequential extraction of soil for the parent monomers as well as transient and terminal degradation products. Both FTAC and FTMAC were hydrolyzed at the ester linkage as evidenced by 8:2 FTOH production. 8:2 FTAC and FTMAC degraded rapidly with half-lives of ~5 and 15 d, respectively. Maximum 8:2 FTOH levels were 6-13 mol% within 3 to 6 d. Consistent with the known biotransformation pathway of 8:2 FTOH, FT carboxylic acids and perfluoroalkyl carboxylic acids were generated subsequently, including up to 10.3 mol% of PFOA (105 d). A total mass balance (parent plus metabolites) of 50-75 mol% was observed on the last sampling day. 7:2 sFTOH, a direct precursor to PFOA, unexpectedly increased throughout the incubation period. The likely but unconfirmed concomitant production of acrylic acids was proposed as altering expected degradation patterns. Biotransformation of 8:2 FTAC, 8:2 FTMAC, and previously reported 8:2 FT-stearate for the same soils revealed the effect of the nonfluorinated terminus group linked to the FT chain on the electronic differences that affect microbially mediated ester cleavage rates.

#### MATRIX NORMALIZED MALDI-TOF QUANTIFICATION OF A FLUOROTELOMER-BASED ACRYLATE POLYMER

Rankin, K. and S.A. Mabury.  
Environmental Science & Technology, Vol 49 No 10, 6093-6101, 2015

The degradation of fluorotelomer-based acrylate polymers (FTACPs) has been hypothesized to serve as a source of the environmental contaminants, perfluoroalkyl carboxylates. Studies have relied on indirect measurement of presumed degradation products to evaluate the environmental fate of FTACPs, but that approach leaves a degree of uncertainty. This paper describes the development of a quantitative matrix-assisted laser desorption/ionization time-of-flight (MALDI-TOF) mass spectrometry method as the first direct analysis method for FTACPs. The model FTACP used in this study was poly(8:2 FTAC-co-HDA), a copolymer of 8:2 fluorotelomer acrylate and hexadecyl acrylate. *For more information, see chapter 4 in K. Rankin's Ph.D. thesis at [https://tspace.library.utoronto.ca/bitstream/1807/69457/3/Rankin\\_Keegan\\_201501\\_PhD\\_thesis.pdf](https://tspace.library.utoronto.ca/bitstream/1807/69457/3/Rankin_Keegan_201501_PhD_thesis.pdf).*

#### RHIZOSPHERE-INDUCED HEAVY METAL(LOID) TRANSFORMATION IN RELATION TO BIOAVAILABILITY AND REMEDIATION

Seshadri, B., N.S. Bolan, and R. Naidu.  
Journal of Soil Science and Plant Nutrition, Vol 15 No 2, 524-548, 2015

This review discusses in detail the processes involved in the immobilization of heavy metals in and around plant root zones as affected by chemical (pH and root exudate) and biological (microorganism) components. <http://www.scielo.cl/pdf/isspn/v15n2/aop4315.pdf>

#### ROBUST MEANS FOR ESTIMATING BLACK CARBON-WATER SORPTION COEFFICIENTS OF ORGANIC CONTAMINANTS IN SEDIMENTS

Gschwend, P.M.  
SERDP Project ER-1747, 39 pp, 2015

The overarching objective of this project is to improve the fundamental understanding of organic chemical sorption to black carbons (BCs), such as soots and chars, in sediments while providing a practical means for evaluating this interaction quantitatively. This evaluation can be done by elucidating the polyparameter linear free-energy relationship (ppLFER) parameters needed to evaluate HOC partitioning between aqueous solution and the water-wet surfaces of BCs, i.e., the compounds' KBC and Freundlich n values, for any compound of interest. <https://www.estcp.org/content/download/38249/362292/file/ER-1747-FR.pdf>

#### THE REMOVAL OF CHROMIUM(VI) AND LEAD(II) FROM GROUNDWATER USING SEPIOLITE-SUPPORTED NANOSCALE ZERO-VALENT IRON (S-NZVI)

Fu, R., Y. Yang, Z. Xu, X. Zhang, X. Guo, and D. Bi.  
Chemosphere, Vol 138, 726-734, 2015

Nanoscale ZVI (NZVI) supported on sepiolite was able to remove Cr(VI) and Pb(II) from groundwater with high efficiency at an S-NZVI dosage of 1.6 g/L. The removal mechanism is proposed as a two-step interaction that includes both the physical adsorption of Cr(VI) and Pb(II) on the surface or inner layers of the sepiolite-supported NZVI particles and the subsequent reduction of Cr(VI) to Cr(III) and Pb(II) to Pb(0) by NZVI. Cr(VI) and Pb(II) removal efficiency by S-NZVI was not affected to any considerable extent by the presence of co-existing ions (e.g., dihydrogen phosphate, silicate, calcium, and bicarbonate). Cr(VI) and Pb(II) removal kinetics followed a pseudo-first-order rate expression. Immobilization of the NZVI particles on the surface of sepiolite might help to overcome the tendency of NZVI particles to agglomerate into larger particles.

#### ISOTOPIC AND GEOCHEMICAL TRACERS FOR U(VI) REDUCTION AND U MOBILITY AT AN IN SITU RECOVERY U MINE

Basu, A., S.T. Brown, J.N. Christensen, D.J. DePaolo, P.W. Reimus, J.M. Heikoop, et al.  
Environmental Science & Technology, Vol 49 No 10, 5939-5947, 2015

In situ recovery (ISR) uranium (U) mining mobilizes U in its oxidized hexavalent form [U(VI)] by oxidative dissolution of U from the roll-front U deposits. Post-mining natural attenuation of residual U(VI) at ISR mines is a potential remediation strategy. Detection and monitoring of naturally occurring reducing subsurface environments are important for successful implementation of this remediation scheme. Isotopic tracers and geochemical measurements of U ore and groundwater collected from 32 wells located within, upgradient, and downgradient of a roll-front U deposit were employed to detect U(VI) reduction and U mobility at an ISR mining site at Rosita, Texas. Results support the use of U isotope-based detection of natural attenuation of U(VI) at Rosita and similar ISR mining sites. **Slides:** <http://www.nma.org/pdf/2015urw/Basu-final.pdf>

#### EVALUATION OF ALKALINE ELECTRO-ACTIVATED WATER AND EGGSHELL AS ACID MINE DRAINAGE NEUTRALIZATION AND MINE TAILING REMEDIATION AGENTS

Kastyuchik, Alexey, Ph.D. thesis, University of Laval, Quebec, Canada. 203 pp, 2015

This study investigated the capacity of chicken eggshells (a widely available waste product) either alone or mixed with alkaline chemical materials and the efficiency of the electro-activation process in neutralizing acidity and maintaining alkaline conditions in sulfide mine tailings. <http://www.theses.ulaval.ca/2015/31907/31907.pdf>

#### EFFECTS OF PH ON THE KINETICS OF METHYL TERTIARY BUTYL ETHER DEGRADATION BY OXIDATION PROCESS (H<sub>2</sub>O<sub>2</sub>/NANO ZERO-VALENT IRON/ULTRASONIC)

Samaei, M.R., H. Maleknia, and A. Azhdarpoor.  
Jundishapur Journal of Health Sciences, Vol 7 No 3, 40-47, 2015

This study examined the effect of pH changes on the removal efficiency and kinetics of MTBE concentrations in an aquatic environment. The best removal efficiency of 50 mg/L MTBE concentration in 89.56% under oxidation occurred with 10 mL/L H<sub>2</sub>O<sub>2</sub> and 0.25 g/L NZVI at pH 3.5. Any increase or decrease of pH from 3.5 resulted in a loss of oxidation efficiency as well as a reduction in the decomposition constant rate. <http://ijhsci.com/47337.pdf>

#### USE OF EVAPOTRANSPIRATION (ET) LANDFILL COVERS TO REDUCE METHANE EMISSIONS FROM MUNICIPAL SOLID WASTE LANDFILLS

Abichou, T., T. Kormi, C. Wang, H. Melaouia, T. Johnson, and S. Dwyer.  
Journal of Water Resource and Protection, Vol 7, 1087-1097, 2015

An investigation of the capacity of an ET cover to reduce surface greenhouse gas emissions when implemented on a solid waste landfill used a numerical model to estimate methane emission and oxidation through an ET cover under average climatic conditions in Bennington, Nebraska. Different simulations were performed using different methane loading flux (5 to 200 g/m<sup>2</sup>d) as the bottom boundary. For all simulations, surface emissions were lowest during the growing season and during warmer days of the year. Percent oxidation was highest during the growing season and during warmer days. The lowest modeled surface emissions were always obtained during the growing season. Correlations between percent oxidation and methane loading into simulated ET covers were proposed to estimate methane emissions and methane oxidation in ET covers. [http://file.scirp.org/pdf/JWARP\\_2015092116000770.pdf](http://file.scirp.org/pdf/JWARP_2015092116000770.pdf)

#### FIELD EXPERIMENTAL CELLS TO ASSESS HYDROGEOLOGICAL BEHAVIOUR OF STORE-AND-RELEASE COVERS MADE WITH PHOSPHATE MINE WASTE

Bosse, B., B. Bussiere, R. Hakkou, A. Maqsoud, and M. Benzaazoua.  
Canadian Geotechnical Journal, Vol 52 No 9, 1255-1269, 2015

A field investigation was conducted to evaluate the effectiveness of store-and-release (SR) covers made with different phosphate mine wastes in reducing water infiltration and controlling acid rock drainage (ARD) generation. Four instrumented experimental cells were constructed with different SR layer configurations (two thicknesses and three materials) placed over a capillary break layer. Volumetric water content, matric suction, and meteorological monitoring time trends were studied for a period of 1.5 years under actual and extreme conditions typical of the arid climate obtaining at the Kettara mine site near Marrakech, Morocco. All net infiltration was released to the atmosphere by evaporation regardless of SR layer thickness and type. Field tests showed that the studied scenarios limited deep water infiltration even under extreme rainfall events. The release capacity of the SR layer was slightly lower for cover systems made with finer-grained phosphate limestone tailing. *See photos of the site in the final project report at*  
<https://idl-bnc.idrc.ca/dspace/bitstream/10625/53705/1/IDL-53705.pdf>.

### General News

#### REMEDiated SITES AND BROWNfIELDS: SUCCESS STORIES IN EUROPE

Perez, A.P., S.P. Sanchez, and M. Van Liedekerke (eds).  
European Commission Joint Research Centre, Brussels. EUR 27530 EN, 190 pp, 2015

The European Commission Soil Data Centre collects data on contaminated sites from national institutions belonging to the European Environment Information and Observation Network (Eionet). Published as an initiative of the Eionet National Reference Centre for Soil, this monograph presents a compilation of 29 stories of the remediation of contaminated soil from 13 countries. The case studies have been organized under eight categories: historical achievements, brownfields, landfill remediation, mining sites, human health protection, networking, and research and education.  
<http://publications.jrc.ec.europa.eu/repository/bitstream/JRC98077/lbna27530enn.pdf>

#### INVENTORY OF AWARENESS, APPROACHES AND POLICY: INSIGHT IN EMERGING CONTAMINANTS IN EUROPE

Alphenaar, P.A. and M. van Houten.  
Ministry of Infrastructure and Environment, the Netherlands, and Public Waste Agency of Flanders, Belgium. RW2034-1/16-003.303, 159 pp, 2016

A study on emerging contaminants and their awareness and policy in the developed world was conducted using interviews, a questionnaire, and a brief literature assessment. Because "emerging contaminants" is used as a concept for an extensive group of parameters, this inventory focused on PFOS and PFOA as representative examples. Though by no means a comprehensive study, this report presents the insights obtained.  
[http://www.emergingcontaminants.eu/application/files/4014/5648/7939/RW2034-1-16-003.303-rapd03-final\\_report\\_Invenory\\_EC\\_and\\_PFAS\\_in\\_EU.pdf](http://www.emergingcontaminants.eu/application/files/4014/5648/7939/RW2034-1-16-003.303-rapd03-final_report_Invenory_EC_and_PFAS_in_EU.pdf)

#### ANALYSIS OF SUPERFUND SITE ASSESSMENT PROGRAM COOPERATIVE AGREEMENTS WITH STATES: BENEFITS OF FLEXIBILITY DURING PRE CERCLA SCREENING

Association of State and Territorial Solid Waste Management Officials (ASTSWMO) Site Assessment Focus Group, 40 pp, 2015

Pre-CERCLA screenings (PCSs), performed as part of the Superfund Site Assessment Process, are considered initial reviews of sites to ensure that uncontaminated sites or sites ineligible under CERCLA are not entered into EPA's Superfund Enterprise Management System active inventory for further Superfund-financed site assessment activities. This report (1) provides additional information about states' use of PCSs and whether additional flexibility in use of federal funds during the PCS process would be beneficial; (2) reports on the number of PCSs performed and their outcomes; and (3) provides recommendations to EPA regarding the PCS process with illustrative case studies.  
[http://www.astswmo.org/files/policies/CERCLA\\_and\\_Brownfields/PCS%20Paper%20July%207%202015.pdf](http://www.astswmo.org/files/policies/CERCLA_and_Brownfields/PCS%20Paper%20July%207%202015.pdf)

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](mailto:adam.michael@epa.gov) or (703) 603-9915 with any comments, suggestions, or corrections.

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