Technology Innovation News Survey

Entries for May 16-31, 2022

Market/Commercialization Information

REGIONAL LEAD, ASBESTOS, TOXIC CHARACTERISTIC LEACHING PROCEDURE (TCLP), AND POLYCHLORINATED BIPHENYLS (PCB) SAMPLING, FIELD TESTING, LABORATORY SERVICES, AND OIL AND HAZARDOUS SUBSTANCE SPILL CONTAINMENT (SOL)
The Naval Facilities Engineering Systems Command (NAVFAC) Midatlantic, Norfolk, VA
N4008522R2635, 2022

This is a total small business set-aside under NAICS code 541380. The Naval Facilities Engineering Systems Command (NAVFAC) Midatlantic requires sample collection and laboratory tests for Asbestos, Lead, Toxic Characteristic Leaching Procedure (TCLP), and Polychlorinated Biphenyls (PCBs). All work is primarily located at the following areas: Portsmouth Site including - Norfolk Naval Ship Yard, Portsmouth; Little Creek Site including - Naval Amphibious Base Little Creek, Norfolk; Sewells Point Site including - Naval Station and Chambers Field, Norfolk; Oceana Site including - Naval Air Station, Fleet Training Center Damn Neck and, Fentress Airfield, Virginia Beach; and Peninsula Site including - Naval Weapons Station, Yorktown and Cheatham Annex, Williamsburg. Work can be added for other locations within the Hampton Roads Area of Responsibility (AOR). The award will be a total Indefinite Delivery/Indefinite Quantity (IDIQ) type contract. Offers are due by 2:00 pm EDT on July 12, 2022. https://sam.gov/opp/c3c7acfc2bd44b6e9334ff42609ea017/view

FY23 CAROLINA GROUP OPTIMIZED REMEDIATION CONTRACT
U.S. Army Corps of Engineers, Savannah District, Savannah, GA
Contract Opportunities at SAM.gov, Solicitation W912HN23S1001, 2022

This is a sources sought notice for market research purposes only under NAICS code 562910. The U.S. Army Corps of Engineers - Savannah District is seeking industry information and feedback with regards to a future Indefinite Delivery/Indefinite Quantity (IDIQ) contract to support environmental remediation activities at Joint Base Charleston-Air, Joint Base Charleston-Weapons, and North Auxiliary Airfield in South Carolina, and Seymour Johnson Air Force Base in North Carolina. The range of activities includes maintenance of established remedies, optimization at applicable sites, and achievement of site-specific objectives. The Contractor shall undertake environmental remediation activities to achieve performance objectives at 48 Installation Restoration Program (IRP) sites and 11 Military Munitions Response Program (MMRP) sites. Responses to this request for information are due by 4:00 pm EDT on July 13, 2022. https://sam.gov/opp/dfa82de084f248e0856d00ddd11541aa/view

Y23 BROWNFIELDS JOB TRAINING (JT) GRANTS
Environmental Protection Agency, Funding Opportunity EPA-I-OLEM-OBLR-22-02

This notice announces the availability of funds and solicits applications from eligible entities, including nonprofit organizations, to deliver Brownfields Job Training programs that recruit, train, and retain a local, skilled workforce by prioritizing unemployed and under-employed residents to obtain the skills and credentials needed for pathways into full-time employment in the environmental field. This program is being funded by the Infrastructure Investment and Jobs Act, Public Law 117-58 (the "Bipartisan Infrastructure Law"). While Brownfields Job Training Grants require training in brownfield assessment and/or cleanup activities, these grants also require that Hazardous Waste Operations and Emergency Response (HAZWOPER) training be provided to all individuals being trained. EPA encourages applicants to develop their curricula based on local labor market assessments and employers' hiring needs, while also delivering comprehensive training that results in graduates securing multiple certifications. Due to additional funding in the Bipartisan Infrastructure Law, the maximum dollar value for the Job Training Grant awards increased from $200,000 to $500,000. Eligible entities are now able to request up to $500,000 in funding. Due to the larger award amount, OBLR will extend the grant performance period up to 5 years. In addition to transportation stipends, reasonable stipends to compensate trainees for participating in training and reasonable child-care subsidies are now eligible uses of grant funds. Please be sure to the check the FY 2023 Grant Guidelines and EPA Guidance on Participant Support Costs for additional information on limitations on stipends and other participant support costs. Entities that were awarded a FY22 Brownfields Job Training Grant (EPA-OLEM-OBLR21-03) are eligible to apply for a FY23 Brownfields Job Training Grant under this solicitation. The total funding available under this competitive opportunity for FY 23 is approximately $12,000,000, subject to availability of funds, quality of applications received, and other applicable considerations. EPA anticipates awarding approximately 25 Brownfields Job Training grants at amounts up to $500,000 per award. Please note, applicants cannot submit multiple applications under this solicitation. The closing date and time for receipt of applications is August 2, 2022, 11:59 p.m. ET.

Cleanup News

2021 NATIONAL OFFICE OF SURFACE MINING RECLAMATION AND ENFORCEMENT AWARD NOMINATION: STINEMAN REFUSE PILE - PATH OF THE FLOOD TRAIL, 2017 ABANDONED MINE LAND ECONOMIC REVITALIZATION RECLAMATION PROJECT
Canary, K.Q. 18 pp, 2021

The Stineman Refuse Pile abandoned mine land economic revitalization reclamation project won a 2021 regional award from the Office of Surface Mining and Reclamation and Enforcement. Approximately 27 acres of coal refuse piles along the "Path of the Flood Trail" in South Fork Borough posed multiple environmental threats to the area. Frequent erosion clogged the unnamed tributary to the Little Conemaugh River, and highly acidic water leached into and impaired local streams. The reclamation project included repurposing an access road into a trail and removing 200,000 yd ^{3} of refuse material. The 1.6-mile trail extension constructed during reclamation repurposed onsite red dog material as the subbase and used a #10 crushed stone for the topcoat. The remaining refuse was regraded onsite, capped with topsoil, and revegetated with native grasses. The project restored the area to its pre-mining conditions. A riparian forest buffer is being planted along the South Fork Little Conemaugh River to help reduce thermal impacts. Tree plantings include Eastern White Pine, Balsam Fir, Eastern Hemlock, Northern Red Oak, Chestnut Oak, White Oak, River Birch, Tulip Poplar, Sycamore, and Mountain Laurel. This report describes the project in detail, including the innovative approach to reclamation, how funds were leveraged, and benefits to the community.
https://files.dep.state.pa.us/Mining/Abandoned%20Mine%20Reclamation/AbandonedMinePortalFiles/Award2021/2021Nomination.pdf
See the national award video: https://www.youtube.com/watch?time_continue=5&v=QtUnZVYP3k8&feature=emb_logo.

SEVEN YEARS OF COVER PERFORMANCE AT MINE WASTE ROCK PILES: INSIGHTS FROM THE SYDNEY COALFIELD
Power. C., D. Hersey, M. Ramasamy, and J. MacPhee.
British Columbia MEND ML/ARD Annual Workshop, 7-9 December, Vancouver, BC, 80 slides, 2021

A high-density polyethylene cover was installed over the Scotchtown Summit waste rock piles (WRP) in Nova Scotia, Canada, in 2011, followed by seven years of field performance monitoring. A range of parameters within the atmosphere, cover, waste rock, groundwater, and surface water were monitored and integrated into a comprehensive hydrogeochemical conceptual model to assess atmospheric ingress to the waste rock, waste rock acidity, and depletion and evolution of groundwater and surface water quality. Defect leakage and water balance methods were employed to determine the daily water flux through the cover systems at each WRP. Results demonstrated that including the geomembrane liners in cover systems reduced the water influx from 28% of precipitation to as low as 0.05%. The composition of the drainage layer overlying the geomembrane influences the water influx, with native soil, granular material, and geocomposite nets providing influx rates of 3%, 0.5%, and 0.05%, respectively.
https://bc-mlard.ca/files/presentations/2021-17-POWER-ETAL-seven-years-cover-performance-mine-waste.pdf *Also see 2021 thesis for more information:* https://ir.lib.uwo.ca/cgi/viewcontent.cgi?article=10830&context=etd

A SELECTIVE SULFATE REMOVAL PLANT USING AN INNOVATIVE APPROACH TO ION EXCHANGE

McLean, W., D. Quinn, and S. Iswaran.
Proceedings of Mine Water Solution, 14-16 June, Vancouver, Canada, 2022

A minimal liquid discharge (MLD) plant designed to meet environmental quality indicators was constructed to selectively remove arsenic, antimony, iron, hardness, and sulfate from mining water. A risk of reduced mine water storage capacity due to surface run-off and increased underground mine dewatering at depth was identified. The MLD plant uses CIF® (Continuous Ionic Filtration) technology and ion exchange chemistry and filtration to remove pollutants from water. Unlike conventional ion exchange systems that use static beds, CIF uses a moving packed bed of ion exchange resin that provides optimized chemistry and the ability to filter solids when needed. Two CIF modules were placed in series for the plant to form a DESALX® system. The first module removes multivalent cations (such as calcium, magnesium, and metals such as manganese and iron), and the second module removes multivalent anions (such as sulfate). During the treatment process, monovalent ions such as sodium and chloride pass through, and a gypsum-based brine is created that can be sent to existing lime precipitation systems for a zero liquid discharge solution. The water produced by the plant meets the performance criteria for sulfate, iron, arsenic, and antimony, with chemical usage below the design criteria. It also meets the quality indicators required by the regulatory agency, potentially allowing the mine site to consider other water management best practices, such as managed aquifer recharge. *See **pages 325-332:***
https://www.mineconferences.com/files/ProceedingsofMineWaterSolutions2022.pdf

SEVEN YEARS OF PFAS PLANNING AND REMOVAL: LESSONS LEARNED FOR THE MINING COMMUNITY

Kwan, P. | Proceedings of Mine Water Solution, 14-16 June, Vancouver, Canada, 2022

An overview of PFAS, where they can be present in mining environments, treatment, and lessons learned by the City of Issaquah, the first community to implement PFAS removal from groundwater, are presented in this paper. PFAS, primarily PFOS but also PFHxS, PFOA, and other PFAS, were detected in a water supply well in 2015 (PFOS was detected as high as 600 ng/L). Wellhead treatment was selected for PFAS removal. Granular activated carbon vessels were installed in a lead/lag configuration, with more vessels planned for future expansions. The system has been used for six years and is one of the world's longest continuously operating PFAS removal systems. This paper discusses the operational challenges and unintended consequences, including much longer than estimated media life and lower operational costs, PFOS contamination of an adjacent and much larger well, issues with radioactive media, biological growth, and ongoing issues with media disposal. Additional PFAS have been detected due to transitioning to newer, more advanced analytical techniques. *See **pages 383-394:*** https://www.mineconferences.com/files/ProceedingsofMineWaterSolutions2022.pdf *See water quality reports for the PFAS system:* https://www.issaquahwa.gov/490/Water-Quality

Demonstrations / Feasibility Studies

PASSIVE TREATMENT OF CIRCUMNEUTRAL MINE DRAINAGE FROM THE ST. LOUIS MINE TUNNEL, RICO CO: PART 2-VERTICAL BIOTREATMENT TRAIN PILOT STUDY

Dean, D.M., J.R. Fricke, A.C. Riese, T.J. Moore, and A.R. Brown.
Mine Water and the Environment [Published 3 May 2022 before print]

Two years of mine drainage treatment were evaluated using a passive system that included a vertical-flow engineered biotreatment cell at the inactive Rico-Argentine mine site in southwestern Colorado. The collapsed St. Louis Tunnel discharges circumneutral mine water from several sources that contain elevated concentrations of Cd, Cu, Fe, Mn, and Zn. A demonstration-scale 114 L/min (30 gpm) gravity-flow passive treatment system consisting of a settling basin, an anaerobic sulfate-reducing bioreactor, and an aeration cascade for effluent polishing was installed. The treatment system generally met target treatment goals for Cd, Cu, Fe, and Pb. Nanophase ZnS in system effluent decreased the frequency of meeting total Zn project treatment goals. High levels of Mn removal were observed in both the anaerobic bioreactor and the aeration cascade. Large seasonal variations in influent metals concentrations and pH present the greatest challenge in managing system performance. https://link.springer.com/content/pdf/10.1007/s10230-022-00857-8.pdf

OPTIMISING OPERATIONAL RELIABILITY AND PERFORMANCE IN AEROBIC PASSIVE MINE WATER TREATMENT: THE MULTISTAGE WESTFIELD PILOT PLANT

Opitz, J., M. Bauer, J. Eckert, S. Peiffer, and M. Alte.
Water, Air, & Soil Pollution 233:66 (2022)

A three-stage pilot system consisting of settling ponds for pretreatment, surface-flow wetlands for polishing, and settling filters for purification was implemented for passive treatment of circumneutral, ferruginous seepage water at a former lignite mine in Germany. The objective of the multistage approach was to demonstrate the applicability and operational reliability to successively remove iron, following Pareto's principle with a site-specific effluent limit of 1 mg/L. The average inflow total iron concentration was 8.4 (± 2.4) mg/L, and the effluent concentration averaged 0.21(± 0.07) mg/L. The bulk iron load (≈69%) was retained in settling ponds, effectively protecting wetlands and sediment filters from overloading. Wetlands and sediment filters displayed similar discrete treatment efficiency (≈73% each) relative to settling ponds, proving indispensable to reliably meet regulatory requirements. The wetlands additionally stimulated and enhanced biogeochemical processes that effectively removed secondary contaminants such as Mn and NH_4^+. The sediment filters reliably polished particulate and redox-sensitive compounds (Fe, As, Mn, NH_4, TSS) while concomitantly mitigating natural spatiotemporal fluctuations that inevitably arise in open systems. Both treatment performance and operational reliability of the multistage pilot system were comparable to the conventional treatment plant currently operated on site. The suitability of the multistage passive setup as a long-term alternative for seepage water treatment on-site was confirmed and provided new insights into the performance and interrelation of consecutive treatment stages.
https://link.springer.com/content/pdf/10.1007/s11270-022-05538-4.pdf

USING COAL COMBUSTION RESIDUES FOR ABANDONED COAL MINE RECLAMATION

Cheng, C.-M., T. Butalia, R. Baker, J. Jent, and W. Wolfe.

Proceedings of the 14th IMWA Congress, Mine Water Management for Future Generations, 12-15 July, virtual, 7 pp, 2021 Two full-scale demonstration projects using coal combustion residues (CCRs) to reclaim abandoned mines were conducted near eastern Ohio's Conesville and Cardinal coal-fired power plants. Water quality data collected from 2010 to 2020 were analyzed to assess the environmental impacts of the approach. Statistically significant water quality changes were observed at both sites after reclamation began. Linear discriminant analysis on the hydrogeochemical characteristics of the water samples identified that use of CCRs had observable influences on the water quality of the underlying shallow aquifers.
https://www.imwa.info/docs/imwa_2021/IMWA2021_Cheng_72.pdf

RESPONSE OF ACID FOREST SOILS TO HELICOPTER LIMING IN THE MONONGAHELA NATIONAL FOREST, WEST VIRGINIA

Fowler, J., J. Skousen, S. Connolly, A. Nottingham, S. Scagline-Mellor, J. Schuler, and L. McDonald | Soil Science Society of America Journal 86(2):487-500(2022)

In anticipation of a large-scale liming project in the Monongahela National Forest (MNF), soils at 10 sites were sampled and analyzed in 2009. Soil in the MNF is acidic because of the leaching of base cations, uptake of Ca and Mg by vegetation, and release of organic acids by organic matter (OM) decomposition. Soil acidity has increased because of anthropogenic acid deposition causing declines in forest health. In 2018, lime was applied by helicopter to a total of 323 ha at a rate of 10 mg/ha. One year after liming, soils were resampled and analyzed, representing five limed and five unlimed areas, using the same procedures to determine whether unlimed soils had changed between 2009 and 2019. Changes in soil pH, acidity, and Al and Ca concentrations were evaluated. Unlimed soil changed slightly in the 10-yr interval in O and A horizons. Liming increased soil pH from 4.6 to 5.9 and reduced acidity values by 73% and Al concentrations by 80% in O horizons. Liming increased Ca concentrations by at least three times and based on first-year results significantly affected soil properties of O and A horizons. Future sampling at three and five years after liming will help evaluate additional changes in the soil as a result of liming and under reduced acid deposition rates. *Also see graduate thesis on project:*
https://researchrepository.wvu.edu/cgi/viewcontent.cgi?article=9061&context=etd

Research

MINTEK'S INTEGRATED CLOSURETM TECHNOLOGY FOR TREATMENT OF ACID MINE DRAINAGE

du Preez, K. | Proceedings of the 14th IMWA Congress, Mine Water Management for Future Generations, 12-15 July, virtual, 7 pp, 2021

CloSURE™ was developed to treat acid mine drainage (AMD) using a process that involves a biological sulfate reduction stage followed by oxidation for sulfide removal and biosulfur production. The process was demonstrated at lab scale and achieved sulfate reduction rates of 196 g/m3/d with 87% sulfate removal and up to 98% sulfide removal. The pH level increased to 7.5, and metals were within South African target water quality limits for irrigation use. Results show that cloSURE is a potential solution to treat point sources of AMD sustainably.
https://www.imwa.info/docs/imwa_2021/IMWA2021_duPreez_129.pdf

LABORATORY TESTING TO DETERMINE THE EFFECTIVENESS OF CAPPING AND RISK OF LONG-TERM METAL RELEASE FROM MINE WASTE AT THE ABANDONED ABBEY CONSOLS LEAD-ZINC MINE, WALES, UK

UK Dent, J., A. Barnes, B. Gersten, M. Roberts, T. Williams, and T. Eckhardt.
Proceedings of the 14th IMWA Congress, Mine Water Management for Future Generations, 12-15 July, virtual, 7 pp, 2021

The effectiveness of a proposed low-permeability cover system for historical mining waste at the abandoned Abbey Consols lead-zinc mine was tested in lab columns. A reduced infiltration rate could result in the release of metals, reducing the benefits of the cover system. Two-column scenarios simulated average infiltration conditions and a reduced infiltration rate (the low-permeability cover). The reduced infiltration column produced higher cadmium, lead, and zinc concentrations but at a lower load. Zinc and cadmium loads narrowed between the two columns over time, suggesting that the benefits of the low-permeability cover diminish.
https://www.imwa.info/docs/imwa_2021/IMWA2021_Dent_115.pdf

PASSIVE TREATMENT OF ACID MINE DRAINAGE FROM THE SIDI-KAMBER MINE WASTES (MEDITERRANEAN COASTLINE, ALGERIA) USING NEIGHBOURING PHOSPHATE MATERIAL FROM THE DJEBEL ONK MINE

Merchichi, A., M.O. Hamou, M. Edahbi, E. Bobocioiu, C.M. Neculita, and M. Benzaazoua.
Science of The Total Environment 807(Part 3):151002(2022)

Passive abiotic treatment of acid mine drainage (AMD) was investigated using low-grade phosphate ore, phosphatic limestone wastes, and phosphate mine tailings from Algeria's Djebel Onk mine. Lab batch tests were performed using the expected lithologies of phosphate materials in contact with synthetic AMD (pH of 3.08) and contained high concentrations of Fe (600 mg/L), Mn (40 mg/L), Mg (10 mg/L), Zn (20 mg/L), Cu (25 mg/L), As (50 mg/L), and sulfate (3,700 mg/L). Phosphate materials were used as an oxic limestone drain to evaluate the increase in pH of the AMD and metal removal by sorption and precipitation mechanisms. All phosphatic lithologies were efficient in AMD passive treatment. The pH rapidly increased from 3.08 to 8.47 during water-rock interactions. The neutralization potential comparisons also showed that the phosphatic limestone wastes neutralized more acid than other lithologies. All materials efficiently removed metals (95.5% to 99.9%). Batch sorption test results showed that the concentration of metals in residual leachates did not exceed the Algerian criteria for industrial liquid effluents. Using the mine wastes for passive treatment of AMD would allow the development of integrated management strategies for these residual materials in the context of sustainable development of phosphate mining.

LABORATORY STUDY ON THE EFFECTIVENESS OF LIMESTONE AND CEMENTITIOUS INDUSTRIAL PRODUCTS FOR ACID MINE DRAINAGE REMEDIATION

Elghali, A., M. Benzaazoua, H. Bouzahzah, and B. Bussiere. | Minerals 11:413(2021)

This study aimed to stabilize acid-generated mine tailings using several alkaline and cementitious amendments in columns for 361 days. The alkaline amendments consisted of 10 and 20 wt.% limestone. The different formulations for the cementitious amendments were 50% Kruger fly ash and 50% class F fly ash; 20% ordinary Portland cement, 40% Kruger fly ash, and 40% class F fly ash; 80% ordinary Portland cement and 20% Kruger fly ash; and 20% ordinary Portland cement, 40% Kruger fly ash, and 40% fly ash. Different binders were used at a total dosage of 5 wt.% binder. Kinetic testing on the amendment formulations showed that the pH values increased from This article is **Open Access** at https://www.mdpi.com/2075-163X/11/4/413

ARSENIC AND IRON SPECIATION AND MOBILIZATION DURING PHYTOSTABILIZATION OF PYRITIC MINE TAILINGS

Hammond, C.M., R.A. Root, R.M.Maier, and J. Chorover.
Geochimica et Cosmochimica Acta 286: 306-323(2020)

The impacts of phytostabilization on the molecular-scale mechanisms controlling As speciation and lability were assessed in a three-year phytostabilization field study conducted at a Superfund site in Arizona. Legacy pyritic tailings contain up to 3 g/kg As originating from arsenopyrite that has undergone oxidation to form arsenate-ferrihydrite complexes in the top 1 m. Tailings were amended in the top 20 cm with 100, 150, or 200 g/kg (300-600 t/ha) of composted organic matter and seeded with native halotolerant plant species. Treatments and an unamended control received irrigation of 360 ± 30 mm/y in addition to 250 ± 160 mm/y of precipitation. Cores to 1 m depth were collected annually for three years and sectioned into 20 cm increments for analysis by synchrotron iron and As X-ray absorption spectroscopy coupled with quantitative wet chemical and mass balance methods. Over 80% of As exists in ammonium oxalate-extractable and non-extractable phases, including dominantly ferrihydrite and jarosite. As release during arsenopyrite oxidation resulted in both downward translocation and As(V) attenuation by stable Fe(III)(oxyhydr)oxide and Fe(III) (hydroxy)sulfate minerals over time, highlighting the need for sampling at multiple depths and time points for accurate interpretation of Asspeciation, lability, and translocation in weathering profiles. Less than 1% of total As was highly-labile from all treatments, depths, and years, and >99% of arsenate released by arsenopyrite weathering was attenuated by association with secondary minerals. Although downward translocation of both As and Fe was detected during phytostabilization by temporal enrichment analysis, a similar trend was measured for the uncomposted control, indicating that organic amendment associated with phytostabilization practices did not significantly increase As mobilization over non-amended controls.

REMOVAL OF URANIUM FROM CONTAMINATED GROUNDWATER USING MONORHAMNOLIPIDS AND ION FLOTATION

Hogan, D.E., R.M. Stolley, C. Boxley, M.K. Amistadi, and R.M. Maier.
Journal of Environmental Management 301:113835(2022)

Uranium-contaminated groundwater (~440 µg L−1 U) from the Monument Valley processing site in Arizona was used as a model solution to test the removal efficacy of ion flotation using biosynthetic (bio-mRL) and three synthetic monorhamnolipids with varying hydrophobic chain lengths (Rha-C10-C10, Rha-C12-C12, and Rha-C14-C14). No uranium was removed from the solution by any collector at the groundwater's native pH 8 or at an adjusted pH 7. At pH 6.5, bio-mRL and Rha-C10-C10 removed 239.2 µg/L and 242.4 µg/L of uranium, respectively. By further decreasing the pH to 5.5, bio-mRL reduced the uranium concentration to near or below the EPA maximum contaminant level of 30 µg/L. For the Rha-C12-C12 and Rha-C14-C14 collector ligands, decreasing the pH to 7 or below reduced the foam stability and quantity, such that these collectors were not suitable to treat this groundwater. Geochemical analysis of the groundwater was conducted to contextualize the results, and consideration of uranium speciation is described.

INNOVATIVE IN SITU REMEDIATION OF MINE WATERS USING A LAYERED DOUBLE HYDROXIDE-BIOCHAR COMPOSITE

Veselska, V., H. Sillerov, B. Hudcova, G. Ratie, P. Lacina, B. Lalinska-Volekova, L. Trakal, P. Sottnik, L. Jurkovic, M. Pohorely, D. Vantelon, I. Safarik, and M. Komarek.
Journal of Hazardous Materials 424 Part A:127136(2022)

A comprehensive field-scale study was conducted to incorporate layered double hydroxides into hybrid biochar-based composites and

apply an innovative material to remediate As/Sb-rich mine waters. The presence of hydrous Fe oxides within the composite enhanced the total adsorption efficiency of the composite for As(V) and Sb(V). Equilibrium experiments confirmed that the composite had a stronger interaction with As(V) than with Sb(V). The efficient removal of As(V) from mine water was achieved in both batch (≤ 98%) and continuous flow column systems (≤ 80%). Sb(V) showed different behavior compared to As(V) during treatment, reaching adsorption efficiencies up to 39% (batch) and 26% (column experiments). Migration of Sb(V) in mine water was mostly attributed to its dispersion before it was able to show affinity to the composite

General News

MINE WATER USE, TREATMENT, AND REUSE IN THE UNITED STATES: A LOOK AT CURRENT INDUSTRY PRACTICES AND SELECT CASE STUDIES

Miller, K.D., M.J. Bentley, J.N. Ryan, K.G. Linden, C. Larison, B.A. Kienzle, L.E. Katz, A.M. Wilson, J.T. Cox, P. Kurup, K.M. Van Allsburg, J. McCall, J.E. Macknick, M.S. Talmadge, A. Miara, K.A. Sitterley, A. Evans, K. Thirumaran, M. Malhotra, S.G. Gonzalez, J.R. Stokes-Draut, and S. Chellam. | ACS ES&T Engineering 2(3):391-408(2022)

This paper identifies current mine water industry practices, including how water is used in mining, influent and effluent water quality, treatment technologies, and end uses to inform future research on implementable, reliable, and cost-effective advanced water treatment in the mining sector. It also includes a techno-economic assessment on water use and disposal for three detailed case studies applicable to lithium, uranium, and copper mines. These case studies highlight specific industry examples of distinct extraction methods, geographical regions, and mined commodities. Hypothetical scenarios based on case study baselines revealed potential impacts to mine water available for beneficial reuse using novel water treatment technologies and alternate water management strategies.

THE ORGANIZATION PLANTING MILLIONS OF TREES IN OLD COAL MINES

Marchant, N. World Economic Forum website, 23 July 2021

Green Forests Work is boosting the local environment and economy in the region by planting trees on former coal mines in the Appalachia region. Since 2009, Green Forests Work has planted over 3 million trees across nearly 5,000 acres in the Appalachia region and beyond. The organization is working to reforest a site near Daniel Boone National Forest, which lies mostly barren with some invasive plant species. The plan is to restore the forest habitat so it can blend in with neighboring and unmined woodland. https://www.weforum.org/agenda/2021/07/green-forests-work-reforestation-climate/ *To read more about Green Forests Work, see* https://www.greenforestswork.org/.

SUSTAINABLE RECLAMATION PRACTICES FOR A LARGE SURFACE COAL MINE IN SHORTGRASS PRAIRIE, SEMIARID ENVIRONMENT (WYOMING, USA): CASE STUDY

Waitkus, A.K. | International Journal of Coal Science & Technology 9:32(2022)

Sustainable reclamation practices were investigated at the largest surface coal mine in a semiarid environment in the U.S. Practices include building post-mining topography to the approximate original contour and reestablishing a stable hydrologic system to drain surface water. All available spoil material is backfilled and graded to achieve a post-mining topography closely resembling pre-mining topography. No overburden or other coal waste material is left in stockpiles. The project involves detailed planning until mine closure and the knowledge of available volumes of suitable backfill material and soil needed for sustainable management practices. Diverse and permanent vegetation capable of stabilizing soil surfaces and self-regeneration is established. Sustainable management of the reclamation effort is achieved by enforcement processes developed by the state and federal agencies.
https://link.springer.com/content/pdf/10.1007/s40789-022-00502-3.pdf

A FUNDAMENTAL ECONOMIC ASSESSMENT OF RECOVERING RARE EARTH ELEMENTS AND CRITICAL MINERALS FROM ACID MINE DRAINAGE USING A NETWORK SOURCING STRATEGY

Larochelle, T., A. Noble, P. Ziemkiewicz, D. Hoffman, and J. Constant.
Minerals 11(11):1298(2021)

This paper provides a fundamental economic assessment of rare earth elements (REEs)/critical mineral (CM) recovery from acid mine drainage using a network sourcing strategy and a robust, flexible feedstock separations and refining facility. The methodology follows a typical techno-economic analysis with capital and operating costs estimated using AACE Class IV (FEL-2) guidelines. Four pricing scenarios were modeled, including current, minimum, and maximum prices over the last decade, to demonstrate the range of possible outcomes. In addition, five production scenarios were considered reflecting variations in the product suite, ranging from full elemental separation to magnet REE and CM production only. Results show that, except for the minimum price scenario, all operational configurations have positive economic indicators with rates of return varying from 25-32% for the contemporary price scenario. The optimal configuration was determined to be the production of Co, Mn, and all REEs except for mischmetal, which is not recovered. Sensitivity analysis and Monte Carlo simulation show that capital cost and HCl consumption are the two major factors influencing the rate of return, indicating opportunities for future technology development and cost optimization. Implications of the study and a cooperative profit-sharing model for sourcing are also described. *This article is Open Access at* https://www.mdpi.com/2075-163X/11/11/1298. *Also see presentation from 2021 British Columbia MEND ML/ARD Annual Workshop:* https://bc-mlard.ca/files/presentations/2021-16-ZIEMKIEWICZ-NOBLE-develop-test-integrated-treatment-extraction.pdf

PFAS AND THE MINING INDUSTRY: UNDERSTANDING THE CHALLENGES

Barfoot, K., A. McGrath, S. Richards, T. Shanoff, and J. Stonebridge.
Proceedings of Mine Water Solution, 14-16 June, Vancouver, Canada, 2022

This paper provides an overview of the challenges associated with PFAS in the environment and the implications these challenges may have for the mining industry. It reviews PFAS use within the mining industry, site characterization challenges, potentially relevant receptors and exposure pathways, remedial options, and the status of PFAS regulation internationally. *See pages 85-99:* https://www.mineconferences.com/files/ProceedingsofMineWaterSolutions2022.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 or (703) 603-9915 with any comments, suggestions, or corrections.

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