**RARE EARTH ELEMENT RECOVERY: INTELLIGENT TECHNOLOGIES FOR LICENSING**

**Market Commercialization Information**

Battelle Energy Alliance LLC for U.S. DOE, Idaho National Laboratory

Contact Opportunities from Beta.Sam.gov, Solicitation BA-IC-7-19-977, 2019

Sales National Laboratory is offering the opportunity to enter into a license and/or collaborative research agreement to commercialize new rare earth element (REE) recovery technologies [NAAE code: S692 - Materials Recovery].

For more information, contact Mike Reisenmesser, Chief of Business Development, Office of Commercialization, at Mike.Reisenmesser@battelle.com or 503-236-2125.

**FREE E-MAIL NEWSLETTER**

Entries for November 16-30, 2019

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**Technology Innovation News Survey**

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This study evaluated the microbial community structure and functional capability associated with the Middle Branch passive remediation system in Central PA. Sediment and water samples were collected from areas within the passive remediation system and along a stream. Environmental parameters associated with the system explained a significant amount of variation in microbial community structure. The study revealed shifts in microbial community structure from undisturbed to impacted sites. The study also observed significant differences in the ability of the two systems to immobilize metals and reduce the metal leaching capacity for simulated AMD released into the systems. The study supports previous investigations that demonstrated the effectiveness of sulfur- reducing bacteria in the process of removing sulfate and heavy metals from contaminated water.

ACID ROCK DRAINAGE/METAL LEACHING (ARD/MRL) AT COOLEGE BRook, MA: FEASIBILITY OF ALTERNATIVE REMEDIAL AND TREATMENT APPROACHES
This feasibility study evaluated the effectiveness of different options to treat acid rock drainage (ARD) and metal leaching (MRL) at the Cold College Brook site in Northampton, MA. An ex situ active treatment system and an in situ permeable reactive barrier were both benchmarked to measure their effectiveness at treating site water. Both tests successfully lowered the pH of the drainage water from 4.2 to 4.9, reduced dissolved aluminum concentrations from 40-300 ppm per billion (ppb) to <10 ppb, and reduced dissolved iron concentrations from 10-500 ppb to < 10 ppb.

LIFE CYCLE ASSESSMENT OF A PASSIVE REMEDATION SYSTEM FOR ACID MINe DRAINAGE: TOWARDS MORE SUSTAINABLE MINING ACTIVITY
A life cycle assessment was performed for a dispersed alkaline substrate system in the Doran Pyrite Belt to determine the environmental impacts generated throughout its life cycle and the factors controlling its environmental performance. Results indicated that although the construction of the plant initially created significant environmental impacts, they became negligible within 4.3 years. Results also showed that the potential impacts of the plant were closely related to the upstream production chain of the materials employed in this technology. Thus, the replacement of certain material sources and circular usage would lead to a significant decrease in impact values. The replacement of wood chips by forestry residue would reduce emissions by 20%-25%. This study also found evidence for the lower carbon footprint of passive treatment in comparison with other waste treatment systems analyzed using life cycle analysis. More information on the carbon benefits of this product can be obtained at: http://www.life-etad.com/index.php/en/project

ENHANCED IMMOBILIZATION OF ARSENIC FROM ACID MINE DRAINAGE BY DETRITAL CLAY MINERALS
In this study, detrital clay minerals originating from the partial weathering of coal mining waste substantially increased total As uptake by acid mine drainage (AMD) sediments. The As immobilization mechanisms by the AMD sediments were identified by the combined use of microbial community structure characterization (16S rDNA analysis), chemical extractions, and synchrony-based 16S rDNA biomarker analysis, and abiotic As transformation. The use of 4-A property size as small as one hundredth of that used in AMD treatment, was found to be an effective method to immobilize As from AMD sediments. The results of this study suggest that the potential of detrital clay minerals as a cost-effective approach for AMD management needs to be further evaluated. This review provides a comprehensive assessment of the main implications and challenges of Mn(II) removal from mine drainage. The review compares several techniques to remove Mn(II) from wastewater, assesses the challenges associated with Mn(II) oxidation, and identifies the key steps in the design and development of effective Mn(II) removal technologies. The review concludes with alternative treatments for manganese removal from AMD and wastewater, and highlights the importance of considering the specific characteristics of each Mn source, including Mn speciation, pH, redox potential, and the presence of other metal ions, in selecting the most effective treatment strategy.

COMPARISON OF METAL PLATEAU FORMATION AND METAL ACCUMULATION IN REEDS CULTURED IN ACID MINE DRAINAGE SOLUTIONS AND SOIlS
Experiments were conducted to compare the effects of cobalt (Co) on metal uptake in Phragmites australis s.l. cultured in acid mine drainage (AMD) contaminated soil or aqueous solutions. When the cofactor Ca was present, it appeared to reduce metal plaque formation around the roots systems of reeds, while simultaneously increasing the metal accumulation in both inoculated and acclimated tissues of reeds cultured in contaminated soil or solution. Co compared to the total Ca, had an effect on decrease in Fe plaque and enhance Fe uptake in solution was more pronounced. In general, the more Co that was added, the more Mn and Fe accumulated in the reeds, especially the higher the Co concentration added, the more Co that accumulated in the reeds. However, there was no significant increase in Co accumulation in the reeds cultured in soil, but had no influence on Al ions in reeds grown in sodum solution. CA could be effective at enhancing the phytoremediation of metals from AMD contaminated soils, depending on the metal levels, types of the metals and the characteristics of soils.

IMPACTS OF POINT-SOURCE NET ALKALINE MINE DRAINAGE (NAMD) ON STREAM MACROINVERTEBRATE COMMUNITIES
Ten low-order tributaries of the Ohio and Youghiogheny Rivers in southwestern Pennsylvania impacted by point-source inputs of net alkaline mine drainage were selected for assessment of water quality and benthic macroinvertebrate communities. Levels of pH, total Fe, and soluble (AS) were significantly elevated in the impacted stream reaches when compared with upstream reference sites, while total alkalinity and specific conductance were equivalent. Community structure in terms of taxonomic composition and species richness was similar. Total Fe, total Ca, and specific conductance were significantly linked to macroinvertebrate community impairment. The presence of net alkaline mine drainage systems in the unimpaired reaches suggests that remediation would result in a rapid recolonization and establishment of stable downstream ecosystems.

A COMPOSITE TAXONOMICAL AND FUNCTIONAL FRAMEWORK OF MICROBIOLOGY UNDER ACID MINE DRAINAGE BIOMEDIATION SYSTEMS
This paper presents an overview of acid mine drainage (AMD) and discusses research developments into various waste materials or by-products from other industries that have been successfully applied in remediating AMD. The potential genetic changes that have occurred as a result of AMD remediating systems are also presented. This paper presents an overview of acid mine drainage (AMD) and discusses research developments into various waste materials or by-products from other industries that have been successfully applied in remediating AMD. The potential genetic changes that have occurred as a result of AMD remediating systems are also presented.

EVALUATION OF ZEOLITE/BACKFILL BLEND FOR ACID MINE DRAINAGE REMEDIATION IN COAL MINE Waste and Biomass Valorization [Published online 13 September 2019 prior to print]
This paper presents an overview of acid mine drainage (AMD) and discusses research developments into various waste materials or by-products from other industries that have been successfully applied in remediating AMD.

BIOMASS ASHES FOR ACID MINE DRAINAGE REMEDIATION
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