RARE EARTH EXTRACTION FIELD TESTS PROVE VERSATILITY OF NOVEL SORBENT

Unique sorbents recover valuable rare earth elements from acid mine drainage (AMD) waters and heavy metals from flue gas desulfurization (FGD) discharge.

**MULTIPLE PROCESSES BENEFIT FROM BASIC IMMOBILIZED AMINE SORBENT (BIAS) DEVELOPMENT**

Rare earth elements (REE) and heavy metals are selectively recovered utilizing a highly adaptable sorbent that is also designed to efficiently capture CO₂. Successful demonstration of cyclic adsorption and desorption of ~90% REE from a synthetic AMD solution, and >90% successful removal of lead from spiked tap water further prove the efficacy of this sorbent for commercial applications. These critical advancements in BIAS technology represent exciting progress towards the realization of a commercial-scale, efficient REE extraction or CO₂ capture process.

**PITTSBURGH BOTANIC GARDEN FIELD TEST ACHIEVES SUCCESSFUL EXTRACTION AND ENRICHMENT OF REE FROM ACID MINE DRAINAGE**

Solid sorbent from a field test conducted at the Pittsburgh Botanic Garden achieved REE concentration enrichments in the evaporated, eluted effluent at 400 to 8,000 times the concentration of the authentic AMD. With ~100% of the bound REE released from the sorbent, the results indicate reusability and commercial viability of the sorbent for REE extractions.

**PRINCIPAL INVESTIGATOR HONORED, PATENTS ISSUED, AND TECHNOLOGY LICENSED**

In Fiscal Year 2020, McMahan Gray received a Distinguished Alumni Award from the University of Pittsburgh’s Chemistry Department for his contributions to chemistry and sorbents. Unprecedented sorbent results have led to a second patent being issued on the BIAS pelleting process for CO₂ capture applications in 2020. The patent “Stable immobilized Amine Sorbents for REE and Heavy Metal Recovery from Liquid Sources” is pending and currently licensed by PQ Inc.

**UNIQUE DESIGN ENHANCES SORBENT STABILITY**

The BIAS sorbents utilize robust amine–epoxide cross-linkages and are designed to be H₂O-stable materials. Advanced technical characterization work with a Scanning Electron Microscope reveals no appreciable change in the sorbent’s structure upon adsorbing metals from real FGD discharge. Stable flow-through sorbent properties during cycling ensures smooth process performance and reduces potential for column plugging.

**CORE COMPETENCIES**

- MATERIALS ENGINEERING and MANUFACTURING
- PROGRAM EXECUTION and INTEGRATION

**AWARD NUMBER**

FWP-1022420 TASK 3

**PROJECT BUDGET**

**FY20 FUNDING**

- TASK 3 $983,000
- TASK 3 $2.3M

**CONTACTS**

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