Critical Mineral Extraction from Ocean Macroalgal Biomass (Algal Mining)

PROJECT DESCRIPTIONS

Pacific Northwest National Laboratory – Sequim, WA

Exploring Macroalgae as Critical Mineral Crops, $E=(MC)^2$ - $1,350,000

Pacific Northwest National Laboratory (PNNL) is studying methods to efficiently extract rare earth elements and platinum group metals from "biological ore": hyper-accumulating species of marine macroalgae. Extraction methods will also re-utilize chemical extractants and retain the value of the algae for other purposes such as biofuels and other industrial feedstocks, resulting in minimal tailings. New instrumentation capability at PNNL will allow for greater resolution analysis of the biological variability of minerals and metals, and the team will develop—among other advancements—adsorbents for extracting metals using specialized metal organic framework molecules that reversibly bind to rare earths in solution.

University of Alaska Fairbanks – Fairbanks, AK

Assessments of Geochemistry, Concentration, and Scalability of REEs Recovery from Seaweeds - $1,878,116

The University of Alaska Fairbanks will investigate the accumulation potential of rare earth elements in hyper-accumulating native seaweed species surveyed around the Bokan Mountain rare earth element deposit in Southeast Alaska. The project will conduct a comprehensive environmental survey to understand how natural erosion transports rare earth elements from ridge to ocean. The team will then collect native seaweed species and conduct biomass tissue chemical composition and polymer analysis to create maps of coastal sites rich in rare earth elements bound to biological materials, along with cultivation guidelines to harvest optimal mineral concentrations. If successful, the findings will guide the selection of seaweed species and farm designs for large-scale cultivation and inform the maximum scalability of seaweed farming operations designed to harvest rare earth elements without the environmental impacts of traditional mining operations.

Umaro Foods – Berkeley, CA

Marine Bio-Ore Mining of Rare Earth Elements - $1,782,000

Umaro Foods is leveraging advancements in chelator technology to efficiently extract rare earth elements and platinum group metals from seaweeds. They will be applying advanced metal chelator molecules to selectively extract metals in a non-destructive manner from process streams producing valuable food-grade seaweed proteins and commodities such as agar, alginate, and carrageenan. Combined with these co-commodities, the development of a sustainable and efficient extraction process from seaweed could bring about an independent, sustainable, and strategically resilient supply of rare earth elements located within the United States.