Goldschmidt 2024 Abstract
https://doi.org/10.46247/gold2024.22774

Critical Mineral Resource Potential in Heavy Mineral Beach-Placer Sandstone Deposits in New Mexico

MATT POWELL[1], GUANGPING XU[1], HECTOR GARZA-GARZA[1], CLAIRE LARSON[1], YONGLIANG XIONG[1], JENNIFER WILSON[1], JASON HEATH[1], VIRGINIA MCLEMORE[2], EVAN OWEN[2] AND SHUYA WEI[3]

[1]Sandia National Laboratories
[2]New Mexico Institute of Mining and Technology
[3]University of New Mexico
Presenting Author: mdpowel@sandia.gov

The demand for critical minerals (CMs) could grow over 450% by 2050. As larger and economical mines will be soon exhausted, smaller deposits, such as placer deposits, provide alternate important resources. Beach-placer sandstone deposits are accumulations of heavy and resistant minerals formed by gravity separation during sedimentary processes on upper regions of beaches or in the long-shore bars in a marginal-marine environment [1]. The heavy minerals in beach-placer sandstone contain high concentrations of titanium, zirconium, and rare earth elements (REEs), which are important CM resources. Heavy mineral deposits have several advantages over other types of mineral deposits: 1) beneficiation process is relatively simple, only requiring density to separate out heavy minerals, and 2) remediation is also relatively simple because corresponding restoration methods are also physical.

In this work, we focused on the Cretaceous beach-placer sandstone from Farr Ranch (Star Lake) in San Juan Basin, New Mexico [1]. The sandstone deposit is layered in mineral compositions alternating from dominantly quartz and feldspar with almost no zircon to ilmenite + anatase rich layer with abundant zircon. The main heavy minerals present are zircon, ilmenite, hematite, anatase and monazite. These mineralogy variations are accompanied by different concentrations of CMs. For example, the ilmenite and anatase rich layer have total REE ~2.85% whereas the quartz and feldspar layer has less than 2000 ppm. Due to the similar heavy densities, zircon, ilmenite, anatase and hematite are co-existing, leading to high concentration of CMs other than REEs, such as 1.2% Ni and 0.7% Zr. Leaching tests using environmentally friendly reagents show that significant amount of CMs, >60%, can be extracted, thus making the beach-placer deposits economically promising to mine.

Reference:
[1] V. McLemore 2010, https://doi.org/10.56577/FFC-61.197

SNL is managed and operated by NTESS under DOE NNSA contract DE-NA0003525. This project is supported by DOE DE-FE0032051. SAND2024-02356A