Critical Mineral Recovery from Unconventional Sources: Developing a Workflow to Evaluate Placer Tailings for Critical Mineral Potential

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Critical Minerals

Essential functionality

Lack of substitution

Vulnerable supply chains
What are Tailings?

- Mine waste rock and water
- What remains after mineral processing

[Images of tailings and mining processes]

https://www.patersoncooke.com/2020/05/06/the-impact-of-ore-body-variability-on-mine-waste-tailings-disposal-systems/

ICMJ's Prospecting and Mining Journal

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Project Goals

Reducing the gap between U.S. supply and demand for critical minerals by reprocessing mine waste (tailings).

There are tens of thousands of tailings sites around the world at both active and historic mines.

Why we can do this: new technology and rising prices of these materials may make it economic to process lower grades, increased importance of US-based mining.
Case Study: Flat, Alaska

Location
A collection of fluvial placer deposits in the Kuskokwim Mountains.

History
A historic gold mine in which traditional methods left significant gold in the tailings. A few small-scale operations exist today.

Potential Resources
W, As, Ti, Cr (critical), Au, Ag, Hg, Zr, and U. Found in scheelite, zircon, chromite, cinnabar, ilmenite, magnetite, monazite, stibnite, fluorapatite, tourmaline, and lead-antimony sulfosalts.
Workflow

1. Weigh samples (in buckets) for wet weights
2. Dry in oven at 98°C
3. Weigh samples for dry weights
4. Put the samples through a spider to disaggregate pieces
5. Gilson screen to create four size fractions
6. Weigh the size fractions for PSA
7. Gravity concentration methods to produce a concentrate, middling, and tailings for each size fraction
   7a. Shaking table (all but the largest size fraction: -12 US)
   7b. Bendelari Jig (largest size fraction: +12 US)
8. Dry in oven at 98°C
9. Weigh the concentrates, middlings, and tailings for each size fraction
10. Split each fraction down to size for chemical assays and analytical techniques

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Initial Results
Conclusions

Tailings are a large potential resource, but we aren’t sure of what they may contain.

I’m developing a workflow for placer tailings that can be applied to any placer site to determine the sites’ critical mineral content and potential.

Early results show that these methods are effective on smaller size fractions. I will be using other methods to further evaluate the methods.

Reprocessing tailings for critical minerals may be an important part of reducing mine waste, increasing supply chain stability, and achieving a just energy transition.
Sources


• https://worldminetailfailures.org/estimate-of-world-tailings-portfolio-2020/

• Museum of North Idaho

• https://www.patersoncooke.com/2020/05/06/the-impact-of-ore-body-variability-on-mine-waste-tailings-disposal-systems/


• ICMJ’s Prospecting and Mining Journal