SUSTAINABLE SOLUTIONS FOR MINING AND REMEDIATION

NOVEL PROCESS

- HPSA is a mechanical process (i.e. no chemicals) leveraging particle - particle collisions.
- HPSA focuses on liberating minerals along their intergranular boundary lines, creating a much more efficient liberation at particle sizes that are coarser than the industry standard.
- Slurries are transported by high-pressure pumps through opposing nozzles, creating impinging jets contained in a collision housing.

GEN A Deployed at Iron Tailings Site

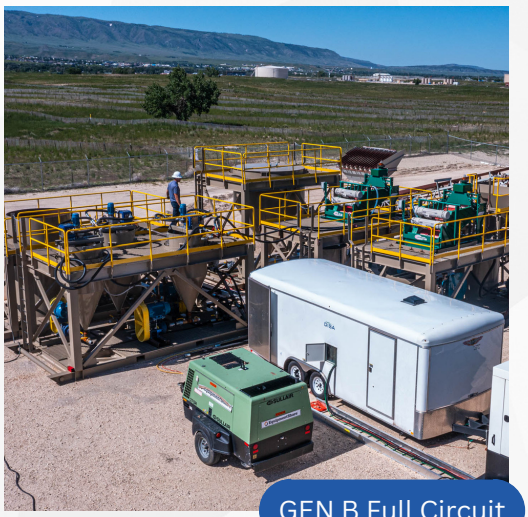
SELECTIVE LIBERATION

- HPSA uses the difference in Mohs hardness between the base mineral and target mineral for selective liberation, which provides a more energy efficient alternative to conventional grinding mills.
- By liberating target minerals from the gangue, the post-HPSA material can be more efficiently separated by size classification or flotation for increased grade and recovery.
- Due to HPSA's ability to selectively liberate, the target minerals are efficiently concentrated earlier in the processing sequence, which reduces the amount of overall material that needs processing. This creates opportunities to reduce or remove downstream unit operations.

HPSA Skid

CONTINUOUS OPERATION

- HPSA can be used as a stand alone system (typically for remediation and tailings applications) or as a "plug and play" unit in the grinding/regrinding stage of the processing circuit (replacing the need for ball mills, rod mills, and/or attrition scrubbers).
- Throughput scaling options based on processing needs - currently offering units with a range up to 50 TPH.
- Units can be applied to any circuit with minerals that benefit from selective liberation. Successful applications currently include, but are not limited to: Uranium / Vanadium / Phosphate / Potash / Graphite / Copper / Molybdenum / Gold / REEs.



GEN B Full Circuit

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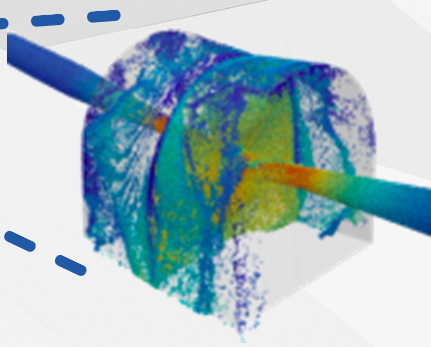
DISA

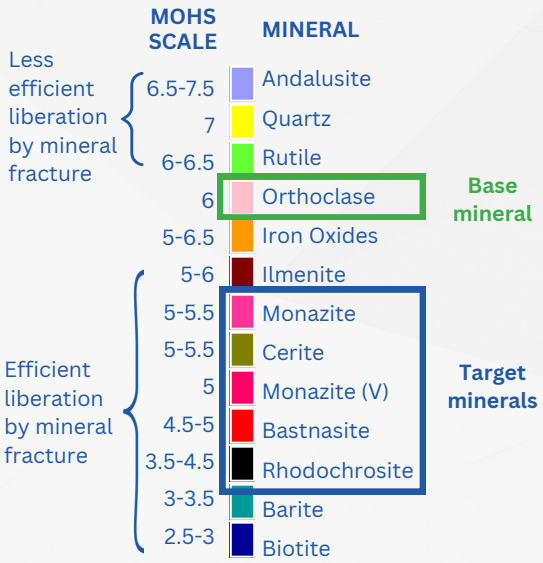
RARE EARTH ELEMENTS



APPLICATION

- HPSA was tested on a rare earth elements (REE) sample to assess how effectively total rare earth elements (TREEs) could be liberated from the gangue minerals.
- The base mineral was orthoclase, with a Mohs hardness of 6. The minerals of interest were monazite, cerite, and bastnasite, with a Mohs hardness of 5, 5, and 4, respectively.

MINERAL LIBERATION ANALYSIS



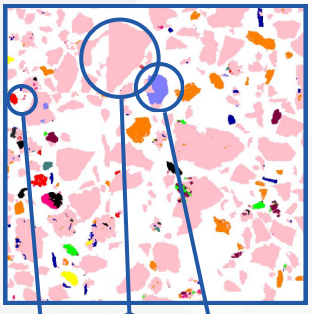
Pre-HPSA sample showing REE association in Orthoclase

Orthoclase associated with Andalusite

Orthoclase associated with Bastnasite

Monazite associated with Orthoclase

Post-HPSA sample illustrating fracture of REEs from hosted Orthoclase

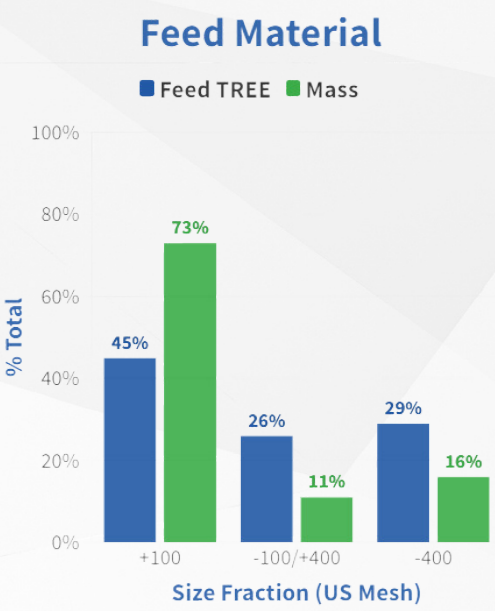


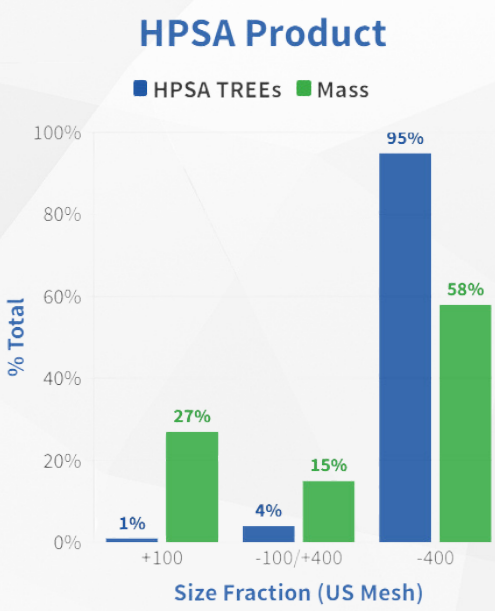
Orthoclase liberated from all REEs

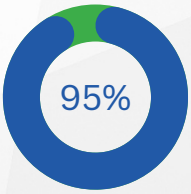
Bastnasite fractured into small particles

Orthoclase still associated with Andalusite

RECOVERY & MASS DISTRIBUTION







OF TOTAL RARE EARTH ELEMENTS WERE RECOVERED INTO 58% OF THE TOTAL MASS.

- Results show HPSA processing improved the recovery of TREEs from 29% in the feed to 95% in the -400 Mesh size fraction.
- HPSA selective liberation reduced the volume of downstream processing by 42%, which can directly lower CAPEX and OPEX.