1.0 Introduction to AMD & Oxidation Rates

Acid mine drainage (AMD) is often a dangerous byproduct of mining deposits containing sulfide minerals. Characterized by the following properties:

- High dissolved metal content (~200,000 mg/L or ppm)
- Extremely high sulfide content (~700,000 mg/L or ppm)

Determination of oxidation rates of pyrite and marcasite at low temperature for acid mine drainage and mineral waste solutions

2.0 Previous Research & Analyses

- Current mitigation / industry research focuses on soil barriers, capping, treatment with lime and neutralizing chemicals
- Gap in research: Can separating sulfide minerals from each other (e.g. pyrite and marcasite) in tailings slow down oxidation and AMD generation?
- Oxidation rate laws developed by McKibben & Barnes (1986) with additional information from McKibben et al. (2007) for Fe-bearing minerals

3.0 Experimental Methods

4.0 ICPMS Concentration Curves, SEM, and Discussion

- ICPMS analysis was done on each sample taken during the experiments (over 150 preliminary data points) to find the concentration of Fe over the experiment time
- Gas combinations of 25%, 75%, and 100% O_2 with balance of Ni were used
- SEM analysis done to confirm use of concentrated nitric acid for cleaning sample grains

5.0 Conclusion & Next Steps

- From comparing trend lines, oxidation rate of pyrite in mine tailings conditions is indicated to be faster when a mix of pyrite and marcasite is used
- This indication suggests a function like a galvanic cell may be forming
- Temperature and pH dependence relationships will be investigated before completion
- From here, an oxidation rate law will be developed from the research elements
- Additional research should focus on economic deposit samples containing multiple sulfide minerals

References

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