

Phosphorus Uptake and Release by Phosphorus Accumulating Organisms (PAOs)



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Background/Motivation

- Phosphorus is a non-renewable resource that is critical to agricultural and biological systems.
- Wastewater is a significant and continuous source of phosphorus.
- PAOs are bacterial and archaeal species that can store and release phosphorus with metal cations in alternating aerobic/anaerobic conditions via Enhanced Biological Phosphorus Removal (EBPR)
- Which factors significantly affect P removal from wastewater?



Objective

- Determine if PAOs are necessary for effective P removal
- Determine if aluminum sulfate is an appropriate cation for P removal by PAOs and/or by chemical precipitation
- Expectation of phosphorus release (increase) in the anaerobic phase and phosphorus uptake (decrease) in the aerobic phase

Methods

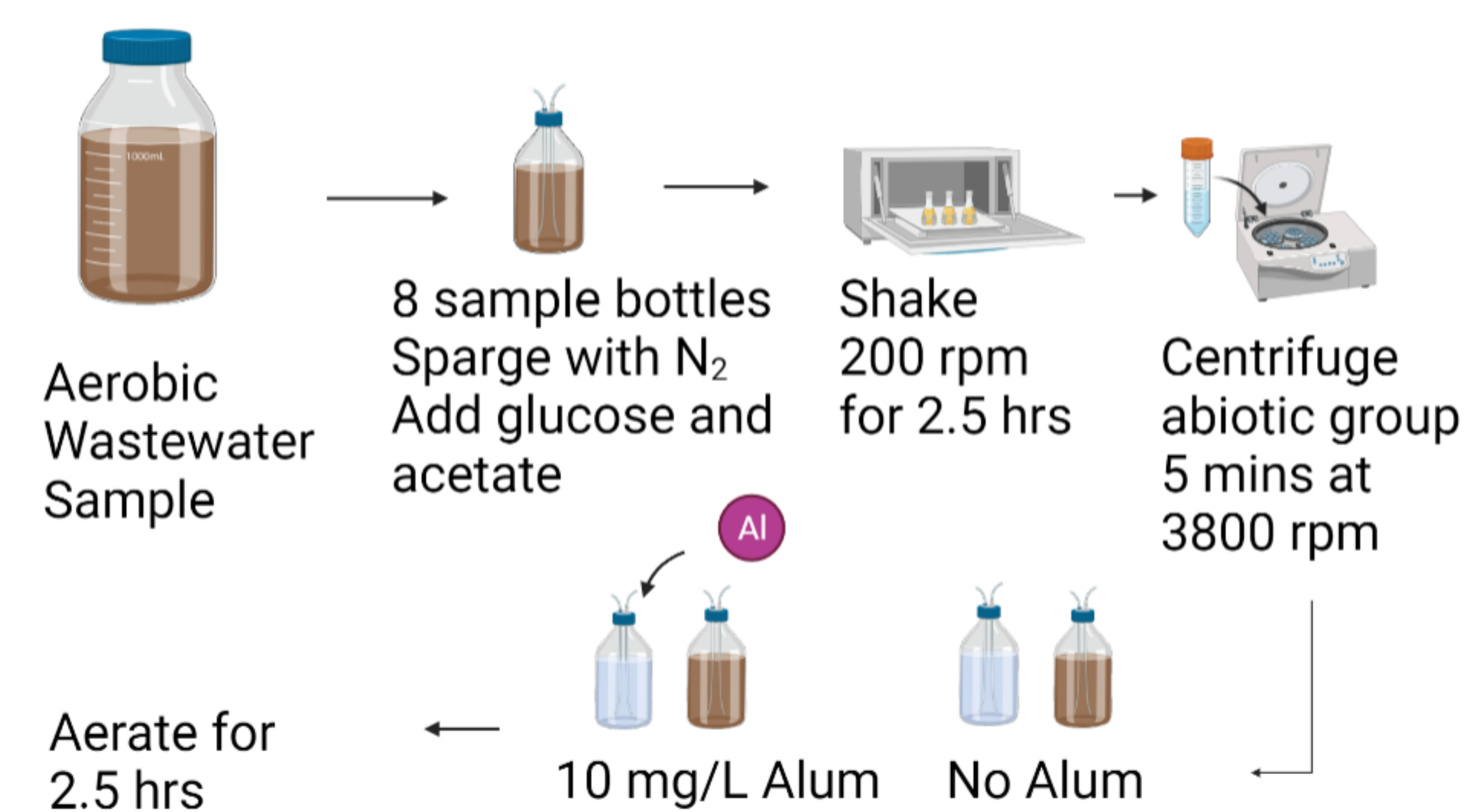


Figure 1. Batch Test Experiment

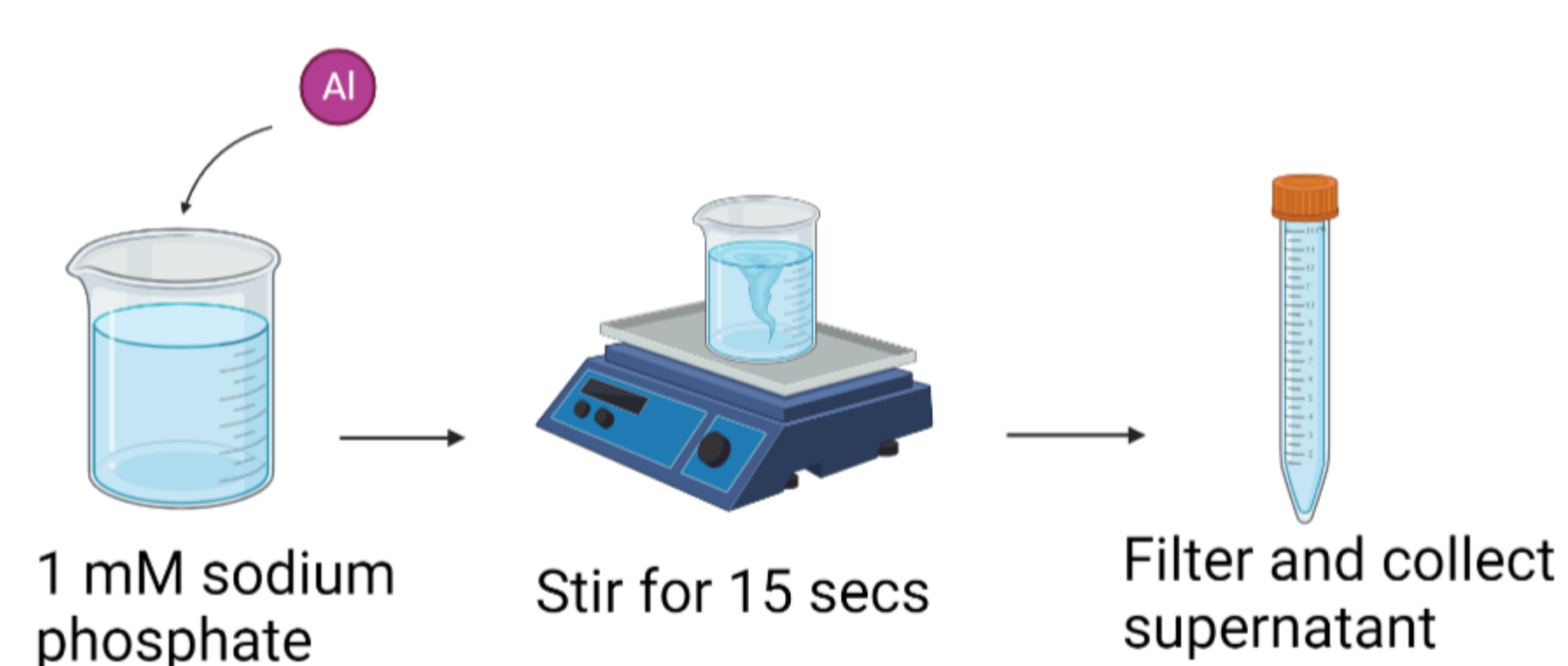
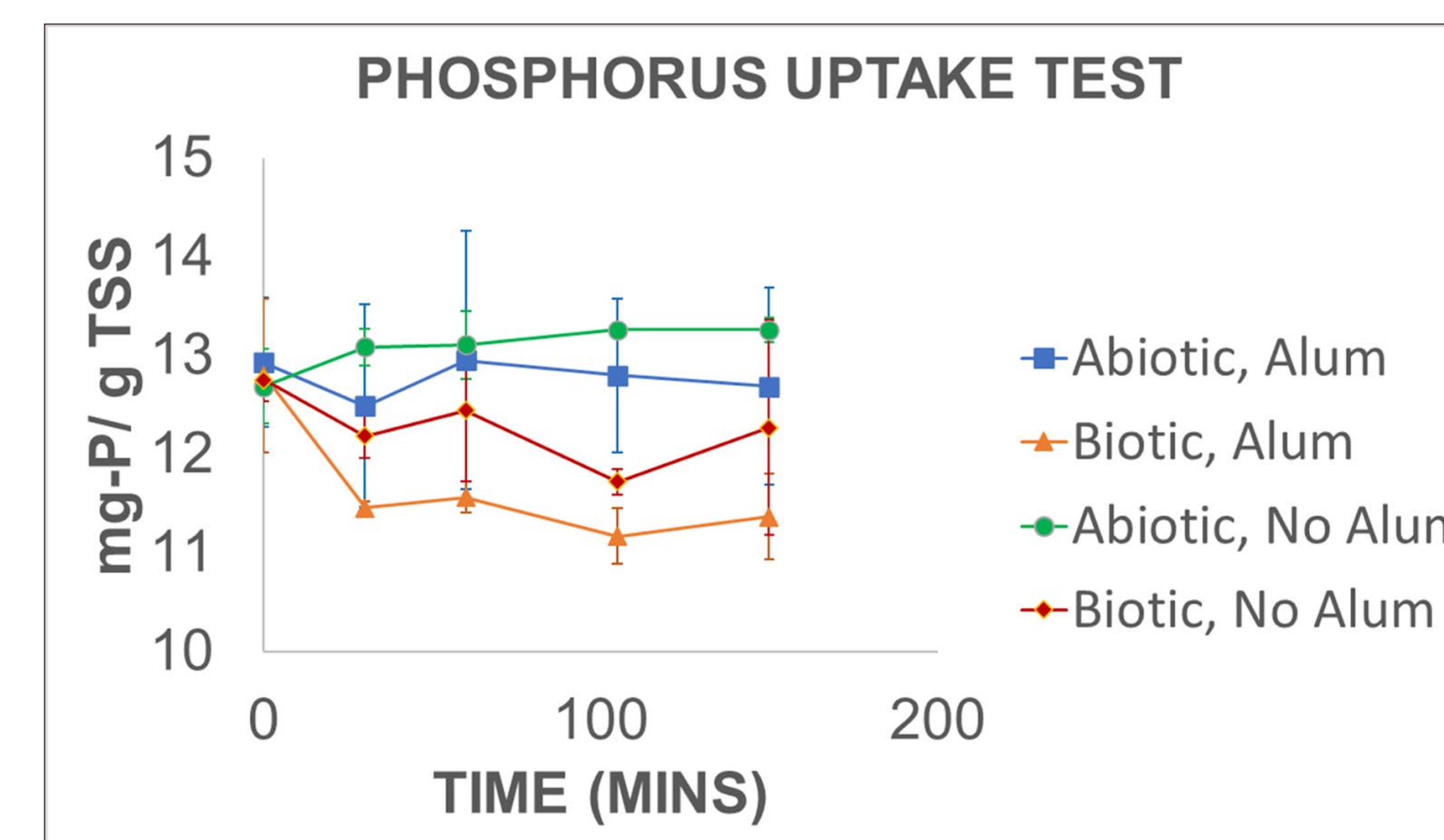
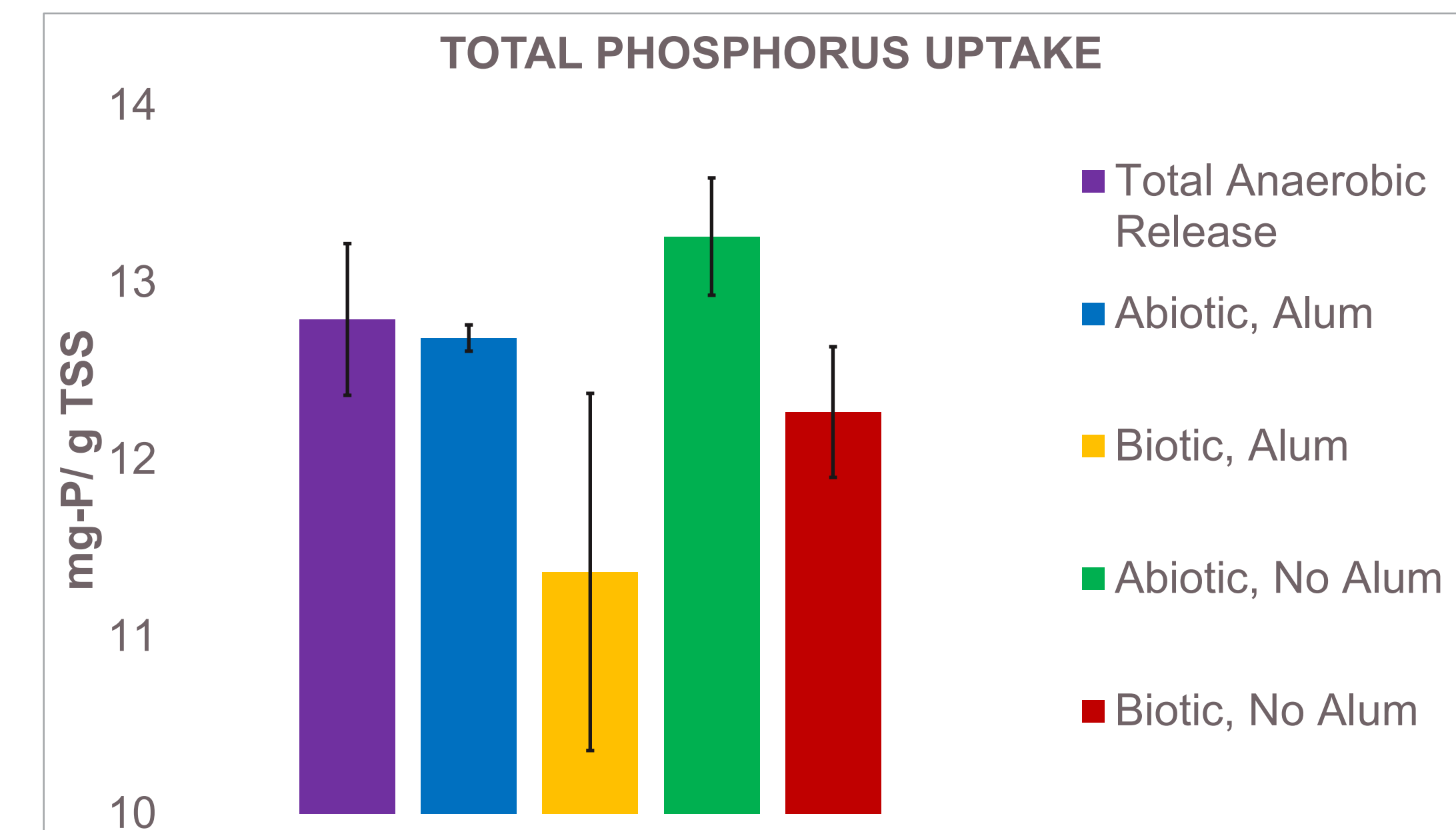


Figure 2. Alum Precipitation Experiment



Figure 3. Phosphorus Measurement Methods

Results



- We used an alpha level of .05 for all statistical tests.
- Results indicate a significant difference in abiotic and biotic conditions with alum added ($p = 0.006$)
- Results indicate a significant difference between abiotic and biotic conditions without alum added ($p = 0.004$)
- PAOs were shown to be effective at P removal during the aerobic phase.
- Alum aided in P removal by PAOs, but chemical precipitation was not as effective.

Figures 4 and 5. Anaerobic P release compared to Aerobic P uptake with all conditions

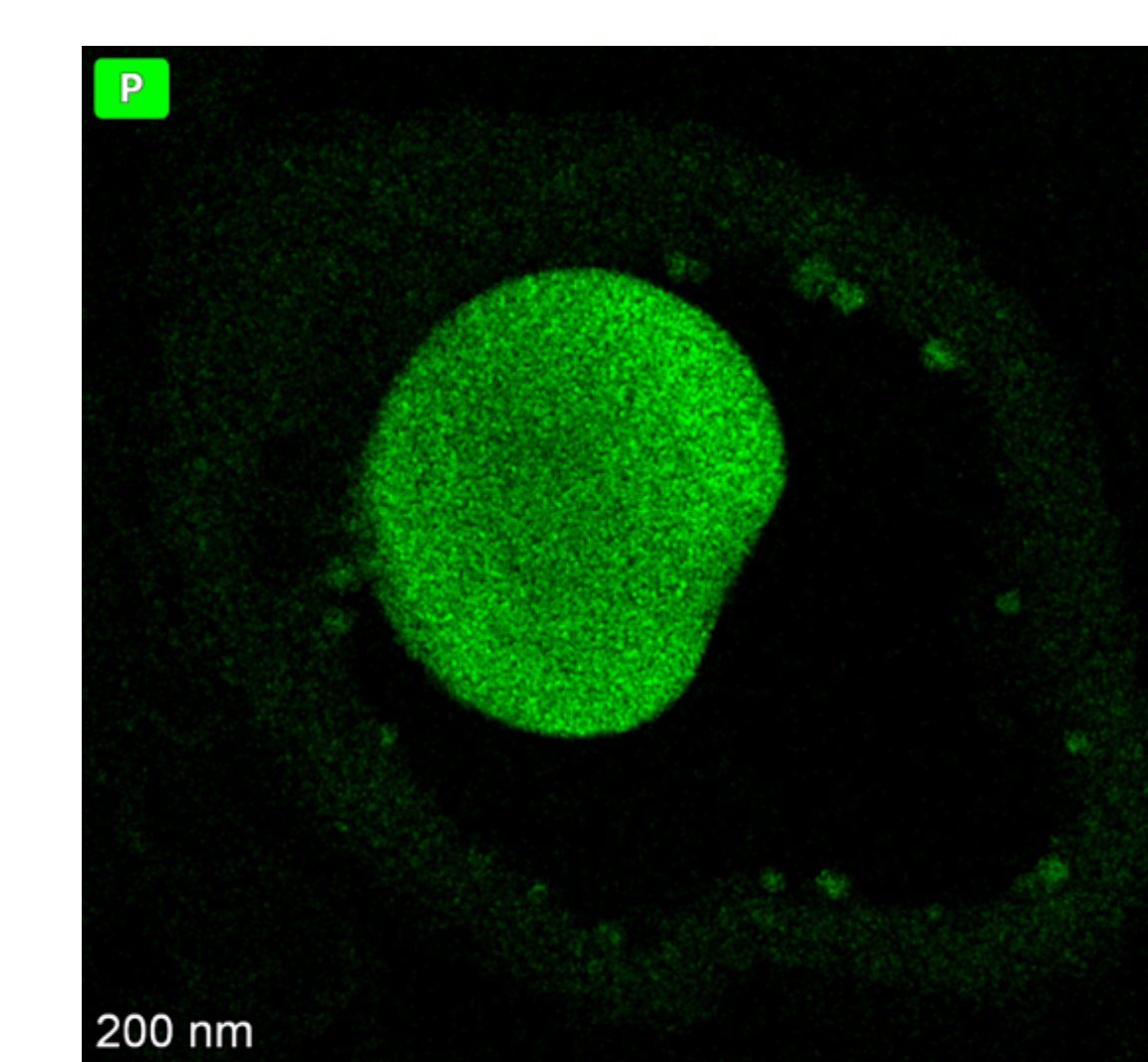
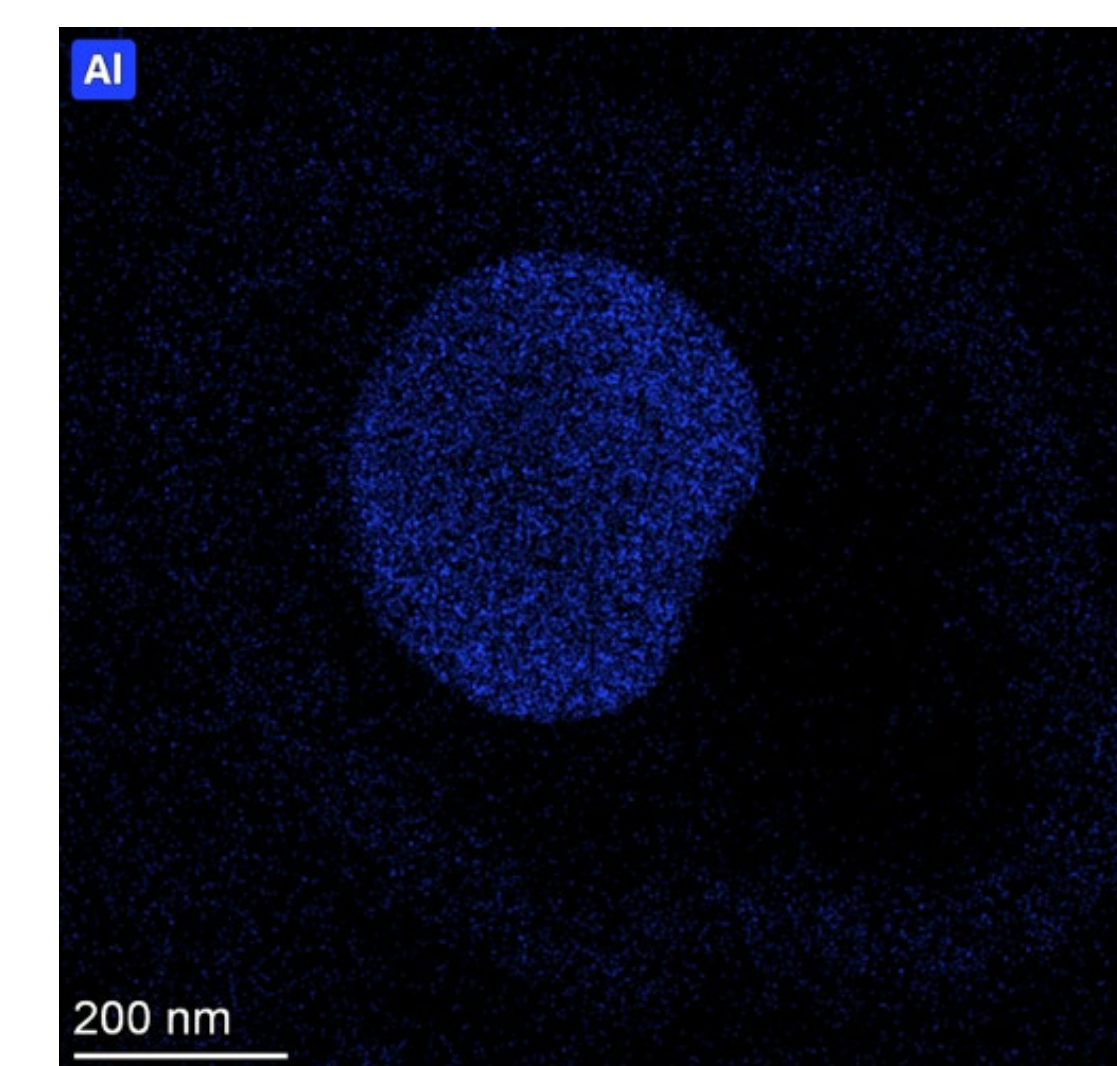


Figure 5. EDS Imaging of PAOs

Acknowledgements

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