

Defence announcement

Public Defence on 15 March 2024

# How Recycled Process Water Quality Affects Flotation of Nickel Minerals

**Title of the doctoral thesis** A Methodology for Systemic Plant Research: An Industrial Case Study Investigating the Effects of Water Quality on Pentlandite Flotation Recovery

**Content of the doctoral thesis** Global demand for critical metals continues to rise beyond what the future mineral reserves would offer, putting more pressure on the mining industry to significantly improve operational-, energy- and water resilience to get the most out of the current ore reserves. The study was centered on a mine situated above the Arctic Circle and investigated the effects of recycled process water on the flotation of pentlandite minerals.

The thesis demonstrates the inadequacy of an engineering-centric approach to process optimization. It shows how process water quality varies with climate change and consequently impacts pulp chemistry. By using the mature theory of flotation to highlight the importance of pulp chemistry, a methodology for systemic plant research that would lead to process optimization was proposed. The poor flotation response of pentlandite during summer months is driven by changes in recycled process water chemistry, affecting pulp chemistry and mineral surfaces.

The thesis highlights the need to assess if recycling process water through the tailing storage facility is suitable for process optimal performance.

**Field of the doctoral thesis** Mineral Processing

**Doctoral candidate and contact information** M.Sc. (Tech.) Benjamin Musuku  
benjamin.musuku@yahoo.com

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**Remote defence** <https://aalto.zoom.us/j/5706821680>

**Place of public defence** Aalto University School of Chemical Engineering, Lecture hall L1, Vuorimiehentie 1

**Opponent(s)** Professor Luis A. Cisternas, University of Antofagasta, Chile

**Custos** Professor Olli Dahl, Aalto University School of Chemical Engineering

**Link to electronic thesis** <https://aaltodoc.aalto.fi/handle/123456789/51>

**Keywords** Process optimization, Process water quality, Flotation, Oxidation, Pentlandite