Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.32083

Effects of Soil Amendments on Metal Mobility and Phytoremediation of Mine Tailings

KATE HALES, MATTHEW D MADSEN, BARRY BICKMORE, BRYAN G HOPKINS AND JOSH LEMONTE

Brigham Young University

Mining physically and chemically alters the surrounding environment, making reclamation a vital part of the mining process. Revegetation is a common reclamation method shown to improve soil quality and immobilize contaminants. However, revegetation can be challenging in mine tailings due to high metal and low nutrient concentrations. These problems may be mitigated using soil amendments, such as biochar – to immobilize metals – and compost or fertilizer – to introduce nutrients. Many studies have examined aqueous metal sorption to soil amendments in the lab, but it is crucial to understand how amendments affect metal mobility and phytotoxicity when applied to mine tailings. This study combines benchtop and greenhouse studies to elucidate the impact of metal-amendment interactions on copper mine tailings. Desorption experiments were conducted to assess metal desorption from amended and unamended tailings. Greenhouse experiments then determined metal uptake by tall wheatgrass grown in the same unamended and amended mine tailings. Copper desorption from tailings increased with the addition of compost and fertilizer, while molybdenum desorption decreased. However, in every combination of amended and unamended tailings Cu and Mo were taken up by plants in rates exceeding generalized toxicity thresholds. Copper uptake was highest for plants grown using a combination of fertilizer + compost, and lowest for plants grown using compost + biochar. Molybdenum uptake was highest for plants grown using fertilizer + biochar and lowest for plants using only compost. These results provide insight into the complex metal-amendment interactions in mine environments and are essential in scaling reclamation technologies for broader field applications.