Greening Chilean copper mining operations through industrial ecology strategies

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Abstract

Sawdust was used as cheap sorbent for the remediation of a diesel and oil fuel-contaminated mining soil whereas biosolids were evaluated as collectors and frothers in froth flotation of copper sulphide ores. The use of these waste materials in copper sulphide ore mining and mineral processing may have a positive impact on the cleaner production of copper from its natural raw sources and may decrease the deleterious effect that mining operations have on the environment. Mixtures of oil fuel contaminated mining soil and sawdust were treated in an aerobic reactor at 50.0% humidity for several days. A significant decrease (over 60.0%) of Volatile Organic Compounds (VOCs) content in these mixtures was obtained after one-month of treatment. Rougher flotation of copper sulphide ores using biosolids – from wastewater treatment plants – and humic acids – a component of biosolids – as collector and frother yielded a copper sulphide concentrate with a copper grade and copper recovery of 0.8% and 26.0%, and 3.5% and 29.7%, respectively. Biosolids and humic acids have shown to be potential candidates to partially substitute traditional organic chemicals used in industrial flotation of copper sulphide ores. This possibility opens up an alternative for greening copper sulphide ore flotation by using more environment-friendly flotation reagents. Based on these results, a conceptual model based on industrial ecology and cleaner production principles is proposed for greening the overall copper Sulphide ore processing.

Keywords: Sustainable mining; Biosolids revalorization; Economy; Environment; Community