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Innovative alternatives to recycling mine wastes in the XXI Century

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Modern mining operations produce vast waste streams that compel planning and informed decision-making in matters relating to waste reduction, resource recovery, waste disposal and environmental protection. A sustainable future for the mining industry should include effective strategies for the reuse and recycling of waste streams. The enormous costs associated with the removal of pollutants from mine wastes using traditional physicochemical remediation technologies have stimulated the development of innovative biological techniques to extract or to stabilize soil pollutants. One innovative alternative suggested for the management of these wastes is the use of specific plant species. Reuse of waste can be considered as a remediation strategy and it is within this context that the concept of phytotechnology can be considered as a step towards sustainable development. The potential for gold phytoextraction (phytomining) has been clearly shown by the extensive record of published laboratory and greenhouse studies; and reports of field trials to date suggest the promise of an economic return. The profitability of this technique also has been suggested for metals such as silver, nickel, thallium and rhenium. Recent studies have shown that the gold and copper average concentrations in plant tissues, when plants are cultivated on mine wastes, can be as high as 55 and 120 mg/kg, respectively and there is an economic case for operation at these concentrations. Environmental benefits with the recycling of mine wastes are a key factor for the phytotechnologies application when metals such as copper (phytoremediation) are removed from these substrates.

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Potential of greenhouse gas emissions for lifecycle of municipal solid waste in Taiwan

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Issues of municipal solid waste (MSW) treatment and climate change have drawn massive attention in the past decades. Taiwan is implementing waste minimization and recycling strategies to curb the waste management issues. In addition, the Taiwanese Government is taking concerted efforts to voluntary reduce greenhouse gas (GHG) emissions to meet relative global warming protocols. This research evaluated potential of GHG emissions from five proposed waste management scenarios, including a landfill site, a waste-to-energy (WTE) plant, and a material recovery facility (MRF) within a defined system boundary. On the basis of the data collected, the results indicate that the MRF (8.08 103 to 1.52 104 kg CO2-eq/day) and the landfill site (4.45 103 to 4.45 104 kg CO2-eq/day) released less GHG emissions than the WTE plant (1.10 106 to 4.39 106kg CO_2-eq/day). The GHG emissions from the WTE plant are highly contributed by CO2 and N2O emissions but offset by generating electricity and energy recovery system. Furthermore, potential of GHG mitigation from recycling wastes in the MRF is more efficient than generated electricity in the WTE plant. This evaluation provides valuable insights into the applicability of a policy framework for MSW management practices in GHG mitigations.

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