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Biodegradation of free cyanide using bacterial species isolated from cyanide waste water

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Abstract

Biodegradation of free cyanide from industrial wastewaters has been proven as a viable and robust method for treatment of wastewaters containing cyanide. Bacterial species degrade cyanide into less toxic products as they are able to use the cyanide as a nitrogen source, forming ammonia and carbon dioxide as end products. Several bacterial species (n = 13) that were isolated from electroplating wastewater were assessed for their ability to degrade cyanide. A co-culture was created by mixing the bacterial strains subsequent to growth on nutrient broth for 48 hours at 37°C, to generate a broth to which free cyanide (200 to 500 ppm) was added to evaluate the species capability to biodegrade the cyanide. The second experimental run was performed using free cyanide (200 and 400 ppm) in batch cultures supplemented solely with agro-waste: [pineapple extract (1% v/v) and beetroot extract (1% v/v)], brewer's yeast waste extract (1% v/v) and whey (0.5% w/v), as the primary carbon source. The microorganisms were able to degrade 131, 152, 177, 155 mg CN^-/L from 200, 300, 400 and 500 mg CN^-/L, respectively. It was also noted that the bacterial species were able to degrade free cyanide in a medium that was supplemented solely with agro-waste. In a medium in which whey was used, it was observed that 179 and 239 mg CN^-/L was biodegraded from 200 and 400 mg CN^-/L cultures, respectively. The primary observations were that, the cyanide degradation efficiency was accompanied by microbial growth; however, the depletion of reducing sugars in the broth affected the degradation efficiency for all cultures.

Biography

Lukhanyo Mekuto is currently pursuing his Master's degree at the Cape Peninsula University of Technology, South Africa. He previously worked for 3 years as a Research Assistant at the Centre of Bioprocess Engineering, University of Cape Town, where he was involved in mineral bioleaching and industrial waste biodegradation research..