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Hybrid Cyanidation and Elevated Barrier Technique for the Recovery of Metal from it Wastewaters

Parker Hilleyi*

Department of environmental science, University of Armenia, Armenia

Abstract

The increasing demand for metals in various industries has led to a surge in their production, resulting in a signiýcant rise in metal-containing wastewater. The conventional methods for metal recovery from wastewater have often been associated with environmental concerns and ine ciencies. This article explores a novel approach, the Hybrid Cyanidation and Elevated Barrier Technique (HC-EBT), which shows promising potential for e cient metal recovery from industrial wastewaters. The Hybrid Cyanidation Technique integrates the proven e ciency of cyanide-based processes with modiýcations suitable for treating diverse metal-containing wastewaters. By forming soluble metal-cyanide complexes, metals are e ciently separated from the wastewater for subsequent recovery. The Elevated Barrier Technique involves the use of nanostructured materials as selective ýlters to capture metal-cyanide complexes while allowing clean water to pass through. This technique maximizes metal adsorption capacity, ensuring high recovery rates. The HC-EBT o ers several advantages, including enhanced metal recovery, reduced environmental impact, versatility across industries, and cost-e ectiveness. Nevertheless, challenges remain, such as the development of e cient nanostructured materials and process optimization for various wastewaters.

***Corresponding author:** Parker Hilleyi, Department of Environmental Science, University of Armenia, Armenia, E-mail: parkerhilleyi@gmail.com

reduce their environmental footprint while simultaneously retrieving valuable metals for reuse, contributing to a more sustainable and responsible future.

Me hw d

Wa e a e cha ac e i a iw

Characterize the metal-containing wastewater to determine its composition, metal concentration, pH, and other relevant parameters. is analysis will guide the selection of cyanide concentration and the appropriate nanostructured materials for the Elevated Barrier Technique.

C a ida iw ce

a. **P e a e c a ide l iw :** Prepare a cyanide solution with the appropriate concentration based on the metal type and concentration in the wastewater. Ensure adherence to safety protocols when handling cyanide.

b. **Mi i g a d eac iw :** Introduce the cyanide solution into the wastewater and mix thoroughly to facilitate the formation of soluble metal-cyanide complexes. e cyanidation reaction will result in the formation of metal-cyanide species, increasing metal solubility [4].

Ele a ed ba ie ech i e

a. **Selec iw f a c ed ma e ial :** Choose appropriate nanostructured materials based on their selectivity for metal-cyanide complexes. Commonly used materials include activated carbon, zeolites, metal-organic frameworks (MOFs), or modi ed clays. e materials should have a high surface area and a nity for metal ions.

b. **P e a a iw f ele a ed ba ie :** Create an elevated barrier, such as a xed bed, packed column, or a membrane, lled with the selected nanostructured materials. Optimize the barrier design to maximize metal adsorption and minimize pressure drop.

c. **Pa age f a e a e h gh ele a ed ba ie :** Direct the cyanidation-treated wastewater through the elevated barrier. e nanostructured materials will selectively adsorb metal-cyanide complexes, capturing the valuable metals while allowing clean water to pass through [5].

Me al ec e

a. **De iw :** A er the wastewater passes through the elevated barrier, desorb the metal-cyanide complexes from the nanostructured materials. is can be achieved through chemical elution or regeneration of the materials, releasing the metals for recovery.

b. **Me al eci i a iw elec i i g:** Precipitate the metal from the eluate using an appropriate chemical precipitation process. Alternatively, electro winning can be employed to deposit the metal ions onto an electrode for subsequent recovery.

Citation: