

TITLE: BIOLEACHING OF METALS FROM SPENT CATALYSTS OF THE PETROLEUM REFINING BY *ACIDITHIOBACILLUS THIOOXIDANS*

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ABSTRACT:

The bioleaching consists in the metals solubilization, in acid environmental, from metabolites produced by chemoautotrophic microorganisms. The bacteria *Acidithiobacillus thiooxidans* is commonly used in this process, for its ability to produce sulfuric acid and biosurfactants. The aim of this work was to compare metals solubilization of two spent catalysts from petroleum refining operations, by chemical leaching (LQ) and biological leaching (LB), in shaken flask and column. The spent catalysts came from Hydrodesulfurization (HDS) and Hydrogen Generating Unit (UGH) industrial steps, consisting of CoMo/Al₂O₃ and Ni/Al₂O₃, respectively. The LQ was performed with commercial sulfuric acid (6 mol/L) and distilled water, at 30°C, shaking at 150 rpm, for 5 days. The LB was done concomitantly with bacterial growth in T&K medium, pH=2.0, with 5 g/L elemental sulfur, 10% inoculum (v/v), 30°C and shaking at 150 rpm, for 5 days. Column leaching was conducted at environmental temperature, for 5 days, with commercial sulfuric acid (6 mol/L) and distilled water (LQ) and bleach from *A. thiooxidans* growth, filtered on membrane with 0.22 µm pore size (LB). The results showed that LQ was more efficient than LB, in shaken flask and column, using commercial sulfuric acid. This can be justified by the lower pH of this solution, compared to bacterial bleach. It was also observed that the system with agitation had a higher of metals solubilization in LQ, mainly Ni and Mo, metals more abundant in the catalysts used. In LB, there was little difference between the two systems, possibly due to the decrease in bacterial metabolic activity, in the presence of metals. Comparatively, HDS catalyst was more susceptible to extraction, in all leaching solutions, in shaken flask and column. The same did not occur with the UGH catalyst, having low extraction in distilled water. This may be related to the pH of the catalysts, being the HDS and UGH catalysts acidic and basic, respectively. It is possible to say that bioleaching may be a promising strategy for metals recovery of spent catalysts. For this, it is necessary to intensify the studies for future application.

Keywords: bioleaching of metals; *Acidithiobacillus thiooxidans*; HDT spent catalyst, UGH spent catalyst

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