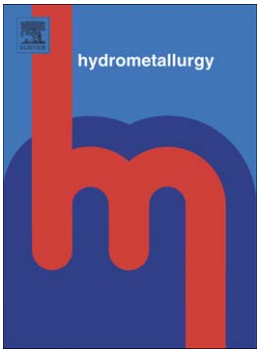


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# Is the growth of microorganisms limited by carbon availability during chalcopyrite bioleaching?

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**ABSTRACT**

Microorganisms, which play a key role during mineral dissolution in bioleaching processes, require $O_2$ to promote the oxidation processes of sulfide mineral dissolution and $CO_2$ or more complex molecules as carbon source for cell growth. Preliminary models have been proposed for relating the microbial succession in bioleaching heaps with the activity of different $CO_2$ fixation pathways. The increase of internal heap temperature during bioleaching improves the rate of chalcopyrite dissolution. However, it also negatively affects $CO_2$ and $O_2$ availability, consequently the microbial community changes and only the best adapted microorganisms are capable of growing under the limiting conditions. In this work we attempt to elucidate how microbiological succession proceeds in a semi industrial bioleaching column test system, with emphasis in determining the identity of the microorganisms participating and the metabolic dynamics of carbon fixation pathways. *In silico* reconstruction of the carbon fixation metabolisms based on available genomes and the gene expression studies using microarray and RNA-seq were performed. The physicochemical conditions and the metallurgical parameters were also included in the analysis. Although the investigation is based on a non-homogeneous system - which leads to some seemingly contradictory data - the results showed a clear change in the structure of the microbial community as well as in the expression of pathways for $CO_2$ fixation, as the column test progressed. These changes were directly related to two factors, the temperature inside column and the $CO_2$ availability. The gene expression analyses confirmed the temporal distribution of microorganisms as a function of the temperature and the different pathways for $CO_2$ fixation. The evidences obtained here support the fact that