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Introduction

The harnessing of microorganism in order to achieve better resource recoveries applying a clean technology is not new. In fact, the ability of living microorganisms to take up metals from aqueous solution was investigated as early as 18th and 19th centuries (Modak *et al.*, 1995). The big question is why the use of these apparently simple unicellular organism, which sometimes are responsible of triggering terrible diseases. Well, there is certainly a group of microorganism that are pathological and humanity is being fighting against them since the beginning. However, it is impossible to be indifferent against their great potential of supporting life in extreme conditions and excelling at using almost everything as sources of nutrients and energy (Glazer *et al.*, 2007).

Bioflotation, it is the process of floating selectively mineral particles using bioreagents. Conventional flotation processes use surfactants as frother and collector reagents; however, it is well known surfactants pose a threat to the aquatic environment (Venhuis 2004). Although one purpose of bioflotation is the substitution of synthetic surfactants, it is interesting to note that 46% of the surfactant market share belongs to the household detergent industry (Levison 2009) and less than 3% may be destined to the mineral industry. Therefore, the reduction on the environmental impact is not the only significant reason for the use of bioreagents. In addition, several studies showed (Mesquita *et al.*, 2003, Botero *et al.*, 2008, Merma *et al.*, 2013) that they have potential to treat low grade deposits that would be considered uneconomic by conventional processes allowing to optimize the mineral recovery process.

On the other hand, even though there is plenty of evidence that bioflotation processes have good recovery and selectivity (Mesquita *et al.*, 2003; Yang *et al.*, 2013), problems such as the low technology and a poor understanding of the mechanisms, kinetics and thermodynamics of the process (Fomina *et al.*, 2014)

hinder a successful scale up. Because the bacteria is a heterogeneous mixture of several compounds, it is complicated to know the specific mechanism by which they selectively turn the minerals hydrophobic. Furthermore, it is interesting to highlight that the theoretical models that describe the adhesion between the mineral and the bacteria do not account for biological factors which may be of importance (Hermansson 1999). The inclusion of a biological frame in the field of bioflotation will have a great significance in understanding what occurs behind the process.

The biomolecules that are responsible of the adhesion and selective floatability of the minerals are surface active substances which are excreted or cell bounded on the microorganism surface (Kuyumcu *et al.,* 2009). They are known as biosurfactants and have several functions such as facilitate the growth of their producers by increasing the substrate availability, transporting nutrients, or acting as biocide agents (Rodrigues *et al.,* 2006). Therefore, in order to narrow the heterogeneity and reduce the complexity of the bioflotation process, this study focuses on the extraction, characterization, modeling and use of a bacterial biosurfactants as a potential flotation reagent.