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A feasibility study for the use of *Acidiothiobacillus ferrooxidans* for acidiophilic bioleaching of lithium ores.

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Lithium was added to the EU critical raw materials list in 2020 in the light of its necessity in the energy transition, and its demand is projected to increase exponentially due to its use in Lithium-ion batteries. Acidiophilic bioleaching has been widely explored as a methodology for the selective removal of metals from minerals, wastes and soils. Despite the importance of lithium, there are few studies on the bioleaching of lithium, nor on the effect of mineral structure or ore geochemistry. This study investigated the bioleaching of jadarite ($LiNaB_3SiO_7(OH)$) with *Acidiothiobacillus ferrooxidans*, an iron-oxidising bacterium commonly used for bioleaching operations, and compared the results with other Lithium-bearing ores, namely lepidolite $(K(Al_{0.62}Li_{0.38})_2Li_{0.92}(Si_{3.58}Al_{0.42}O_{10})(OH)_{0.485}F_{1.51})$ and spodumene ($LiAl(Si_2O_6)$). Experiments were conducted for 175 days in a basal salt, trace element rich medium acidified to pH 1.5 and inoculated with *A. ferrooxidans*. By the end of the experiment the concentration of lithium in the jadarite medium increased to an average of 157 mg/kg, substantially higher than the negative abiotic control which yielded 79 mg/kg. There was little change to lithium concentration into solution for the lepidolite and spodumene bioleaching. Biofilm formation was observed on the jadarite surface, suggesting direct bacterial dissolution of the mineral surface. In the experiments with spodumene and lepidolite, solution lithium concentrations were the same in the biotic leaching experiments and the abiotic controls, and no biofilm formation was observed. The presence of competing metals such as magnesium had little effect on lithium release in the case of jadarite bioleaching and appeared low for lepidolite and spodumene bioleaching, therefore increasing the possibility of extracting lithium through bioleaching from of non-processed solids such as lithium-bearing sediments and wastes. The results of this study suggest that acidiophilic bioleaching may be a viable treatment opportunity for lithium recovery from jadarite-bearing sediments with further experimental adjustments.