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BOOK OF ABSTRACTS

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Microbial Recovery of Copper and Zinc from Wasted Electronic Parts

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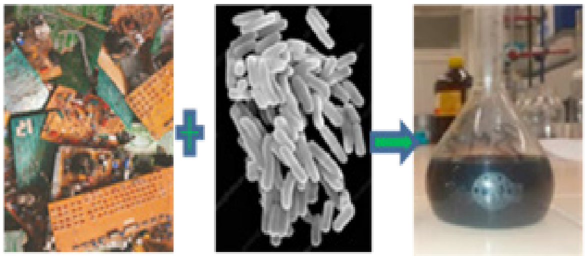

Recycling of electronic waste is crucial not only from the viewpoint of waste treatment but also from aspect of the recovery of valuable metals [1].

The aim of our study was to investigate the potential of using the *Acidithiobacillus* sp. B2, to solubilize metals (Cu and Zn) from electronic waste.

Methodology

Chemical analysis of electronic waste and pyrite

The electronic waste (after separating of the plastic parts) and pyrite were pulverized and sieved through a 63 µm stainless steel sieve in preparation for chemical and leaching studies.

Electronic waste preparation for the leaching experiment

The presence of alkali components in electronic waste is considered inconvenient for the reaction between the electronic waste and the acidic iron(III) sulphate solution. Hence, it is necessary to neutralize the electronic waste before adding the bacterial culture which would generate the oxidant. Before the leaching experiment, electronic waste was dispersed in 0.05 M H_2SO_4 solution, shaken for 48 h, filtered from the solution, washed out with deionized water and dried at 110 °C [2].

Preparation of pyrite for the leaching experiments

The pyrite concentrate for the leaching experiments was prepared by treating with a 0.5 mol/dm^3 sulphuric acid solution (pH ~ 0.5) (solid to liquid phase ratio 1:5 m/V), and mixing with a mechanical stirrer at a room temperature overnight. Then, the solution was decanted, washed with deionized water and dried at 80 °C to a constant mass [2].

Leaching experiments

The leaching experiments were carried out with bacterium *Acidithiobacillus* sp. B2. Experimental conditions were: leaching period of 20 d, 50 ml leaching solution (g/dm^3): $(NH_4)_2SO_4$ (3), K_2HPO_4 (0.5), $MgSO_4$ x $7H_2O$(0.5), KCl (0.1), $Ca(NO_3)_2$ (0.01), at a pH of 2.5 in 150 mL Erlenmeyer flasks at a pulp density of 10% (m/V) (5 g leaching substrate in 50 ml solution). The pH of the leaching solution was maintained at a constant value during the leaching process. One half of the substrate was pyrite and the other was an electronic waste. The initial number of microogranisms was 10^7 per mL, determined by the Most Probable Number method. The control suspension had the same chemical content and pH value as the suspension with *Acidithiobacillus* sp. B2 but the *Acidithiobacillus* sp. B2 culture had been inactivated by sterilization. The study was realized on a horizontal shaker. The incubation temperature was 28 °C [2].

Results and conclusions

The results of the effective metal leaching (calculated by subtraction of percentage metal leaching in the control suspension from that in the *Acidithiobacillus* sp. B2 suspension) are as follows: Zn (38%)>Cu (35%). The obtained results demonstrate that *Acidithiobacillus* sp. B2 was able to grow in the presence of electronic waste and may be "green" agents in the area of circular economy and sustainable development.

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