Biohydrometallurgical Methods for Co i Ni Recovery from Printed PC Motherboard

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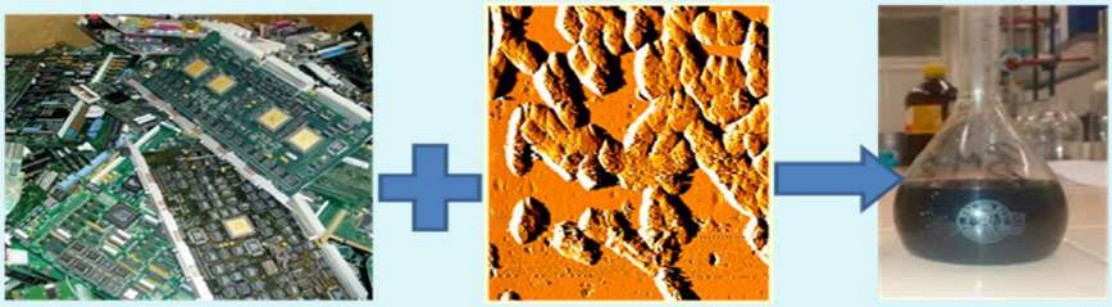


E-waste is one of the fastest growing waste. E-waste contains lots of valuable resources together with plenty of heavy metals and hazardous materials, which are considered both an attractive polymetallic secondary source and an environmental contaminant. Therefore, recycle of valuable metallic from them are necessary and compulsory in many developed/developing countries [1]. .

The aim of our study was to investigate the potential of using the *Acidithiobacillus* sp. B2, to recovery Co and Ni from printed PC motherboard.

Methodology

Chemical analysis of electronic waste and pyrite

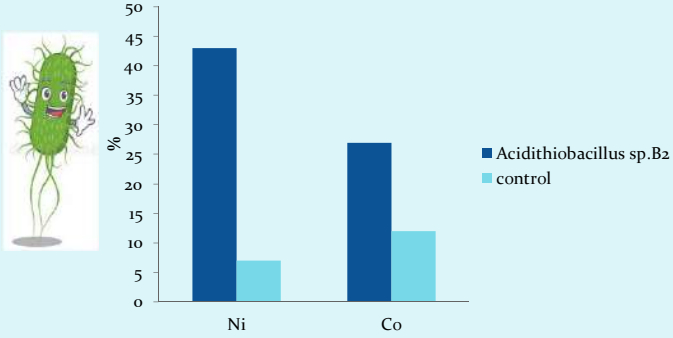
The electronic waste (after separating of the plastic parts) and pyrite were pulverized and sieved through a 63 μm stainless steel sieve in preparation for chemical and leaching studies.

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].

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): $FeSO_4$ x $7H_2O$ (44.8) $(NH_4)_2SO_4$ (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. The initial number of microoganisms was 10^9 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: Ni(36%)>Co(15%). E-waste recycling will be a very important sector in the near future from economic and environmental perspectives. Recycling technology must ensure that e-waste is processed in an environmentally friendly manner. Authors feel that biohydrometallurgical method will be a key player in the metal recovery.

Acknowledgements

This work was financially supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia (Grant no. 451-03-9/2022-14/200026 and Grant no. 451-03-68/2022-14/ 200052).

References

[1] M. Kaya (2016) *Waste Management,* 57, 64-90.
[2] J. Jekić, V. Beškoski, G. Gojgić-Cvijović, M. Grbavčić, M.M. Vrvić (2007) *Journal of the Serbian Chemical Society,* 72, p.