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作品名稱	Anaerobic Respiration: A Novel Bioelectrochemical Copper Recovery System?
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Abstract

Increasing concentrations of copper in discharged effluents pose hazards to aquatic food chains. This project aimed to develop a self-sustained copper remediation system based on electrical and microbiological principles. The production of electrons during yeast fermentation was investigated to catalyze the reduction reaction of dissolved copper ions.

An electrical circuit was designed to harness electrons produced from either a pure or mixed culture of yeast, and were compared for voltage outputs. This system utilized a combination of carbon cloth and copper wire as the electrodes, and a magnesium sulfate based electrolyte. The better-performing cell was subjected to copper reduction analysis, in which various initial concentrations of copper were examined. Further data analysis was carried out on the voltage outputs achieved with both the mixed and pure cultures of yeast, in which an average base line was established and voltage flunctuations were compared to that of the base line. In this way, it was possible to determine the amount and severity of each voltage flunctuation — thus demonstrating whether mixed or pure cultures of yeast produced more stable outputs. Throughout the experiment, self-constructed equipment, including arduino microcontroller moderated incubators and drip-feed systems were implemented to maintain an optimum yeast growth rate.

It was found that mixed yeast cultures produced smoother electrical potential outputs in response to feeding and stress intervals. The copper recovery experiment was therefore conducted using the mixed culture. Through a series of conductivity measurements indicative of copper concentrations, metal recovery was successfully demonstrated. Trend line analysis indicated similar flunctuations between voltage output and copper recovery rates, demonstrating how copper was recovered as a result of electrons harnessed from the yeast culture. These findings can be applied to the development of an energy efficient and cost-effective copper remediation system for contaminated water effluents.

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The experiment is a clever combination of knowledge about biology and chemistry in exploring the principles of a fuel cell. The results are clear and find some phenomena that can be source of further exploration, not in the immediate utility of the devise, but in the understanding of the underlying processes.