

# Hong Kong Student Science Project Competition 2022

Extended Abstract (Investigation)

(Word Limit: 1,000 words, Pages: 2 pages only)

**Team Number:** JBBC059

**Project Title:** Copper(II) Sulphate Ions Concentration Cell Battery Lamp

**Project Type:** Investigation (Type B)

To our best knowledge and after thorough literature research, as at 30/6/22, there are no\* similar works. If there are, the reference links are as below:

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The enhancement our project has made for the existing related products or research is summarized as below:

<https://www.khanacademy.org/science/chemistry/oxidation-reduction/cell-potentials-under-nonstandard-conditions/v/concentration-cell>

\*Please delete if not applicable. HKSSPC values the originality of works. Students must conduct literature research thoroughly to ensure that their works are unique, and to list relevant reference materials to complement the research or invention.

## I. Background

- We are aiming to create a lamp that is affordable and also educational to the grassroots.
- We will be experimenting for how to generate the most voltage and design the battery, since we have seen no one make anything, not even a simple LED light from it, we decided to give it a try

## II. Objectives

- We are aiming to create a lamp that is affordable and also educational to the grassroots.
- We measured the voltages generated by a simple chemical cell with two beakers of solution, one being saturated sodium sulphate solution and the other with copper(II) sulphate solution with different concentrations.

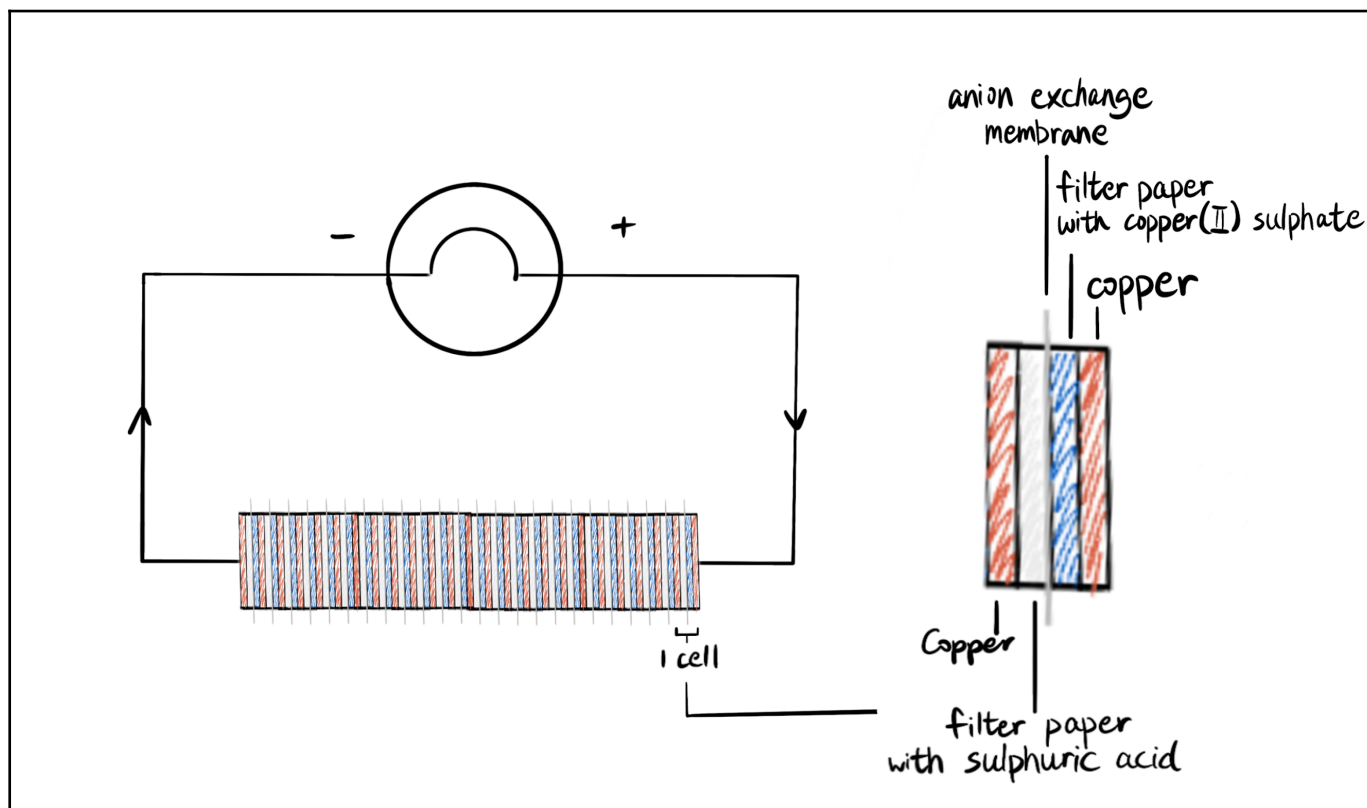
## III. Hypothesis

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## IV. Methodology

We measured the voltage generated by a simple chemical cell with two beakers of solution, one being saturated sodium sulphate solution and the other with copper(II) sulphate solution with different concentrations.

We used a voltmeter to measure the voltage generated by the 24 cells. For each cell, we used 2 filter papers, each soaked with copper(II) sulphate with the concentration of 30g/ 100mL and sulphuric acid. In between the two filter papers is separated by an anion exchange membrane. At the front and back of the cell is sandwiched by two pieces of copper.



## V. Results

Concentration of $\text{CuSO}_4$	0.003g/100mL	0.03g/100mL	0.3g/100mL	3g/100mL	30g/100mL
Millivolt	71	88	97	108	112

From the above result, it is proven that most voltage can be generated at the highest concentration of  $\text{CuSO}_4$ , 30g/100mL.

## VI. Conclusion

From our experimentation, we have found that the copper(II) sulphate concentration cell battery lamp is unsuccessful against our aim of creating a cheap and educational lamp kit, here are the reasons:

- it is too expensive, the anion exchange membrane alone cost around \$180
- the filter paper soaked with  $\text{CuSO}_4$  and  $\text{H}_2\text{SO}_4$  dried up too quickly, it is not sustainable

□ **Our project is developed based on our school's previous project and the enhancement is as below:**