

Study on the Improvement of discharge characteristics for Mg primary cell

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Abstract

To realize sustainable society and solve increase of energy demand, we focused on a battery as a familiar energy source and we want to improve it. So, we're studying on $\text{Mg} | \text{H}_2\text{SO}_4 \text{aq} | \text{Cu}$. Because of the high ionization tendency of Mg, H_2 generates on the negative electrode and decreases the efficiency. Therefore, we thought the control method of the reaction by plating Mg.

1. Introduction

Recently, we have been consuming a lot of fuel. As a result, that causes global warming. The government have taken measures to reduce the CO_2 . Mainly, they combine the power plants with the renewable energy to optimize the power source configuration. However, there are still many problems to solve regarding safety. From the above, we started thinking about improving efficiency of the cell.

2. Experiment

I. Comparison of Zn and Mg

We measured change of voltage and duration of $\text{Zn} | \text{H}_2\text{SO}_4 \text{aq} | \text{Cu}$ and $\text{Mg} | \text{H}_2\text{SO}_4 \text{aq} | \text{Cu} (\text{H}_2\text{SO}_4 : 1.0 [\text{mol/L}])$.

II. Determination of optimum concentration of sulfuric

We researched most suitable molar concentration of sulfuric: 5.0 to 0.050[mol/L], and measured the duration: time to stop the propeller.

III. Plating on Mg

We thought electron is consumed too much because of generation of H_2 from negative electrode. Then, we tried to cover surface of Mg by plating with $\text{CuSO}_4 \text{aq}$ and to decrease H_2 gas generation. We prepared Mg ribbon coated with $\text{CuSO}_4 \text{aq}$. We used the electrical diagram of Fig.1 and we measured voltage and duration of the cell.

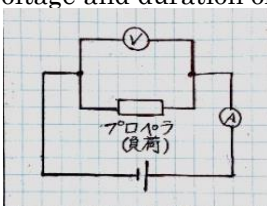


Fig.1 Circuit diagram



Fig.2 State of generated H_2

3. Results

I. From Fig.3, the cell with Mg had longer duration and higher voltage.

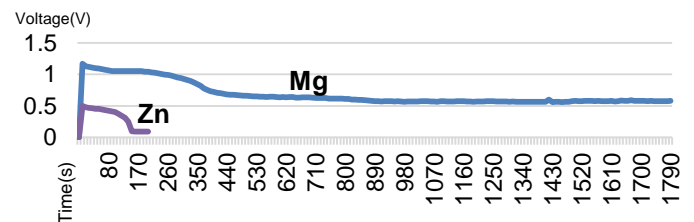


Fig.3 Comparison result of voltage change during cell drive

II. From Fig.4, the most suitable molar concentration of $\text{H}_2\text{SO}_4 \text{aq}$ is 0.25[mol/L].

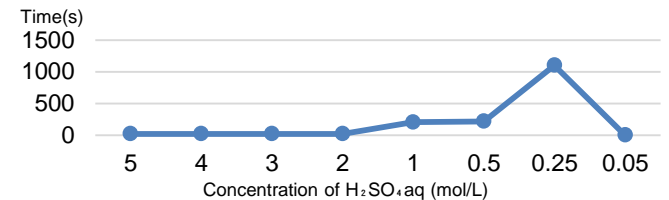


Fig.4 Relationship between duration and electrolyte

III. From Table1, duration of the cell with plated Mg was shorter.

Table1 Evaluation in plating on the negative electrode of Mg

	Time	The best voltage (V)
Not plated	18m20s	1.047
Plated	17m38s	1.100

4. Discussion

In this research, we found that 0.25[mol/L] is the most suitable molar concentration of $\text{H}_2\text{SO}_4 \text{aq}$.

From now on, we'll try to increase the durability of the cell by changing the way of plating Mg.

5. References Discussion

[1] Kazuki Kyougoku, (2013) 『電池の「なぜ？」がわかると未来が見える』, Jitsugyo no Nihon Sha, Ltd.