A title here

Rui Li
Qiushi science class (chemistry)
Chu Kochen Honor College

Abstract inserted here.

Keywords: Some keywords intended.

CONTENTS

I. INTRODUCTION

Electrode potential is derived from the thermodynamics' second law that for an arbitrary process occurred in a system, the maximum non-volume work is given by

$$W_{\text{non-}pV} \leq -\Delta G, \tag{1}$$

and for a process involving electron transfer, electric work dominates the non-volume work. Faraday pointed out its linearity towards the amount of electrons transferred, as is natural in electric circuits,

$$W_{\text{non-}pV,\text{max}} = -\Delta = nFE \tag{2}$$

where n is the total amounts of electrons transferred, F the Faraday constant representing electric charges of 1 mol electrons, and E represents the electric potential in the circuit provided by the reaction. Thus it is evident that Any reaction that involves electron transfer and a decrease in Gibbs free energy can be applied as an electric power source.

Nernst equation is deduced in the system of chemical equilibrium, from the equation of which was deduced in the former report,

$$\Delta G_m = \Delta G^{\ominus} + RT \ln Q = \Delta G_m^{\ominus} + RT \ln \frac{\alpha_{\text{product}}^{c_i}}{\prod \alpha_{\text{reactant}}^{c_j}} \tag{3}$$

and when decomposing it into half-electrode reactions for oxidants and redox, combining it with the Faraday equation, it is deduced that

$$E_{\text{red}} = E_{\text{red}}^{\ominus} - \frac{RT}{zF} \ln Q' = E_{\text{red}}^{\ominus} - \frac{RT}{zF} \ln \frac{\alpha_{\text{red}}}{\alpha_{\text{Ox}}} \tag{4}$$

where α represents the fugacity of the matter in the solution, and z the amount of electrons per mole of reaction that transferred. The same can be deduced for the redox reaction.

According to Kirchhoff's circuit laws, the current will cause an decrease in the measurement of the potential of a battery using simple electric circuits due to inevitable resistance for the battery. Thus an apparatus that can measure a potential with no current through the battery needs to be adopted, linear sweep vltammetry as one of the examples. The apparatus in this experiment is much simpler, involving several variable resistances with battery that provides a standard electric potential, which can help deduce the electric potential of the target battery according to the Kirchhoff's circuit laws.

II. METHODS AND PROCEDURES

A series of standard solution of KCl and standard solution of $AgNO_3$ in different concentrations was prepared respectively. Each battery consists of a pair from four electrodes - saturated calomel electrodes in saturated KCl solution, silver chloride electrode in different concentration of KCl solution, silver electrode in different concetration of $AgNO_3$ solution - are measured using Model UJ-25 high voltage DC potentiometer.