Effect of the Erythrosine Dye on the Electrical Conductivity of Internal Electrolyte for Long-Term Performance of Ag/AgCl Electrode

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1. Introduction

The Ag/AgCl electrode has been widely used as a reference electrode in electrochemical applications. As the potential of an Ag/AgCl electrode depend on the activity of Cl^- ions in the electrode [1-2], it could cause a considerable potential shift of the electrode when the electrode is immersed in a solution for a long period of time. For this reason, many technologies [3-4] have been developed for the long-term performance of the reference electrode.

This work aims to compare dilution rate of erythrosine dye and KCl internal electrolyte, when the internal electrolyte of the electrode is diluted by a long-term exposure in very dilute solutions. The relationship between the dilution rates of erythrosine dye and Cl^- ions was expected to be important to improve the long-term performance of the Ag/AgCl electrode. Before the study on the relationship, it should be confirmed the basic performance of erythrosine dye as a spectrally-active material of the Ag/AgCl electrode. Therefore, we investigated the effect of the erythrosine dye on the electrical conductivity and the effect of KCl concentration on the UV/VIS absorbance of erythrosine dye.

2. Methods and Results

Commercial erythrosine dye (2-(6-hydroxy-2,4,5,7-tetraiodo-3-oxo-xanthen-9-yl)benzoic acid)) was used as spectrally-active material in KCl solution. We measured the electrical conductivity and the UV/VIS absorbance of the test solution, respectively. The maximum absorbance of erythrosine dye at 530 nm was selected.

2.1 Interference effect of erythrosine dye on the electrical conductivities of internal electrolyte of the Ag/AgCl electrode

We performed a measurement of the electrical conductivity of KCl in erythrosine dye. Figure 1 shows that the electrical conductivity of the internal electrolyte solution was nearly a constant value for each erythrosine dye concentration measured.

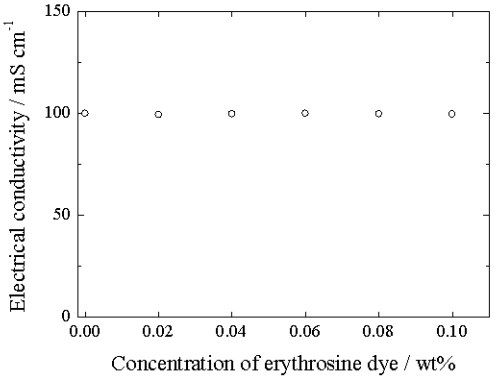

Fig. 1. Electrical conductivity change of various erythrosine dye solutions (0-0.1 wt%)

2.2 Effect of KCl concentration on the UV/VIS absorbance of erythrosine dye

The UV/VIS absorbance of the various erythrosine dye of 0-0.2 wt% was measured in the KCl solution of concentrations 0.001-1 M, respectively.

Figure 2 shows the relationship between the UV/VIS absorbance of erythrosine dye and the KCl concentration. It was found that the intensity of absorbance of the erythrosine dye has linearity as a function of the dye concentration of 0-0.2 wt%, up to 1 M KCl.

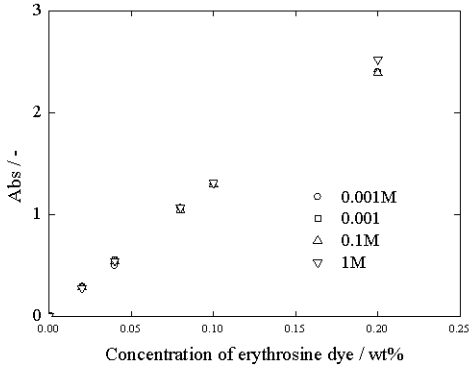

Fig. 2. Relationship between the UV/VIS absorbance at λmax = 530 nm and the erythrosine dye concentration in various KCl solution; 0.001 M (○), 0.01 M (□), 0.1 M (△), 1 M (▽)

3. Summary

We found that the electrical conductivity of the electrolyte was independent of the concentration of erythrosine dye and the UV/VIS absorbance of the dye was independent of the KCl concentration. Therefore, the basic performance of the erythrosine dye was confirmed as a spectrally-active material of the Ag/AgCl electrode.

Acknowledgements

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