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침액형 광도검지기를 사용한 흡광광도 적정에 관한 연구

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An Immersion-Type Photometric Probe for Photometric Titration

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요 약. 감광트랜지스터 끝에 렌즈를 부착시켜 지향성을 충분히 좋게 한 것을 유리관 끝에 접착 밀봉하여 광도 검지기를 만들었다. 적정용액속에 이 감지기를 수직으로 담거 세우고, 밑에서 빛을 조여 올리면서 적정하는 방법을 발전시켜, 밝은 실험실에서 흡광광도 적정을 실시할 수 있게 하였다.

Abstract. A photometric probe that can be immersed in liquid has been prepared by sealing a phototransistor with a collimating lens in a glass tubing water tight. Due to the directional sensing property of the probe, it has been successfully used in photometric titrations. Thus, when the probe is immersed in the titrand solution vertically and a light source is placed underneath the beaker containing the titrand, the relative absorbance of the solution can be measured without shielding from the room light.

Introduction

In normal photometric titrations, it has been necessary to keep the titrand vessel in a dark chamber in order to avoid the effect of the scattered room light, which is quite a nuisance. Many vessels have been improvised or constructed for use in spectrophotometric titrations[1]. However, none of them is free from undesirable features such as the need of the use of a light shield, inconvenience in agitation of the solution, etc.

Just to determine the end-point of a titration by the photometric method, information on the optical path length is not required, since only the relative variation of the optical density of the solution gives desired result. Therefore, an immersion-type photometric probe should be quite useful in such cases provided it is free from the effect of the room light. The present report describes the development of a liquid-immersion type photoprobe provided with a certain directional characteristics that make photometric titration in an illuminated room possible, without requiring shielding of scattered light thus allowing agitation of the titrand by simple means.

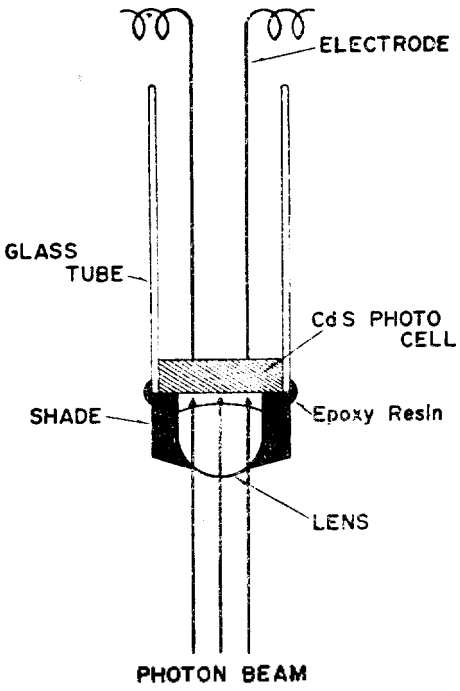

Fig. 1. Schematic cross-sectional view of an immersion-type photoprobe.

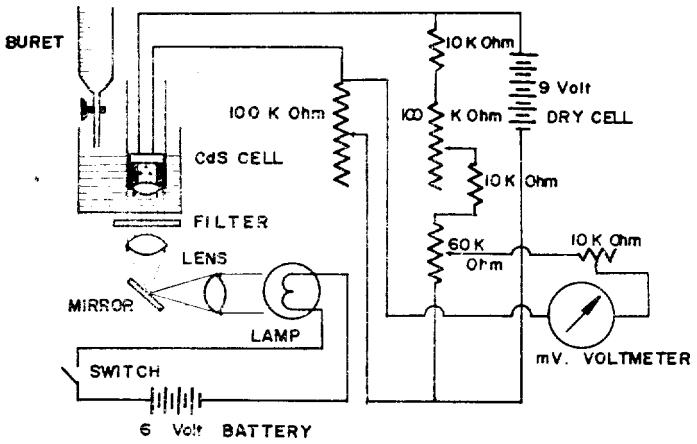

Fig. 2. Schematic of the photometric titration apparatus.

Experiment

Reagents. Since the purpose of the present work is to examine a procedure of photometric end-point detection, commercially available AR grade reagents were used without further purification.

Apparatus. The photoprobe was constructed by sealing a cadmiumsulfide photodiode or a phototransistor, on which a lens and shade are mounted in an open end of a glass tubing by using epoxy resin as shown in *Fig.* 1. A photoprobe, a light source, and the titrand beaker are arranged for use in the photometric titration as shown in *Fgi.* 2. schematically. In most of the experiments, a filter was inserted between the solution and the source light in order to have an improved sharpness of the end point.

Procedure. After placing the titrand in the beaker, the bridge circuit is adjusted to obtain null on the indicator meter. Of course, the source light has to be on for a while before hand, to allow sufficient warm up time. Then, titration is carried out by adding titrant in certain increments and recording the meter reading after each addition.

Results and Discussion

The typical titration curves are shown in *Fig.* 3. Although, no attempt has been made to shield the scattered light in the laboratory, quite regular titration curves have been obtained. Therefore, it can be concluded that the directional response of the photodetector used has been sufficiently narrow angled and the effect of the laboratory illumination has been reduced to a negligible extent.

The use of either a photodetector with a narrow range of spectral response or a monochromatic light source should give the same result as using a filter. Also, instead of reading the variation of the bridge potential, nulling the potential should give better sensitivity as

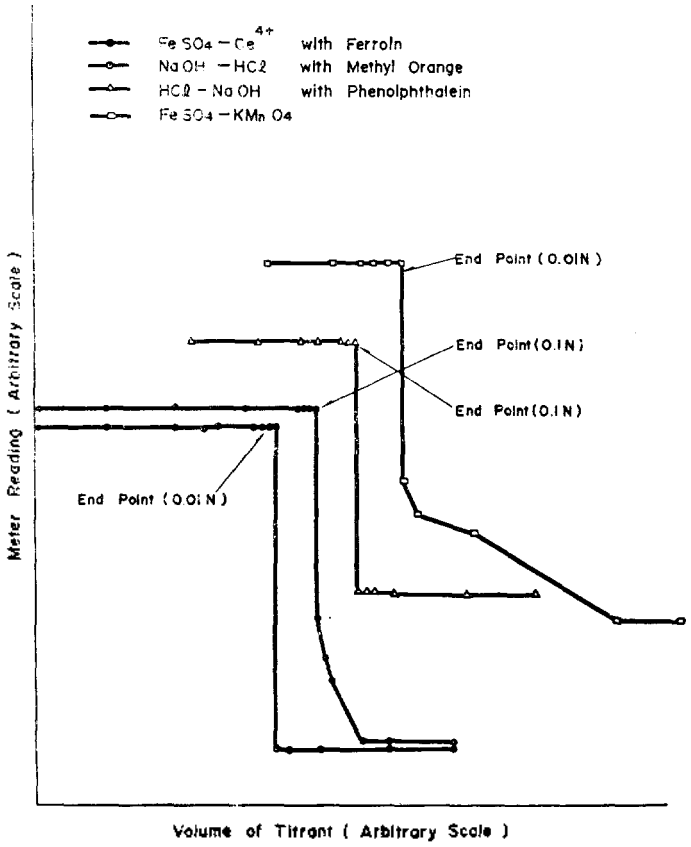

Fig. 3. Typical photometric titration curves.

is known in circuit analysis.

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