RESEARCH ARTICLE

Estimation of Triprolidine Hydrochloride Drug by Manufacturing of a New Plastic Ion Selective Membrane Electrodes

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ABSTRACT

This study includes the estimation of Triprolidine Hydrochloride (TR) using the electrodes of Manufactured selective liquid membranes, where the selective electrodes of the drug from the active substance with sodium tetraphenylborate (STPB) and using (Di-n-butyl phthalate, DBPH) Organic plasticizers with polyvinyl chloride, PVC as an electrodes substrate. The results indicated that the tilt of the TRP-STPB electrode is 29.4 mV/decade, and at a range of pH (3.5–5.0), the electrode response was good for the concentrations of the drug, and the concentration was 10^{-1}–10^{-4} molar, correlation coefficient 0.9942, and the detection limit (2.5×10^{-8} g.mL^{-1}μ) The electrode life was 14 days. The electrode selectivity was measured with single- and dual-charged compounds and ions. The electrode proved successful in estimating the drug and with a Retrospective of at least 98%.

Keywords: Triprolidine Hydrochloride, TRP-STPB-DBPH membrane selective electrodes.

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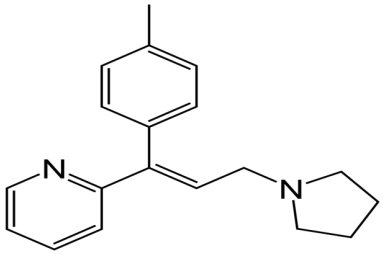
INTRODUCTION

The glass electrode, which responds to hydrogen ions, considered the beginning of the development of membrane electrodes, as discovered by Cremer.[1]

The selective electrode method is considered better than spectral methods of analysis because it is fast and has a wide linear range, and is not affected by the color of the sample, simple, inexpensive, and easy to preparation and operation[2,3]

In the 1960s, solid electrodes were discovered,[4] with heterogeneous membranes, including the selective fluoride electrode[5] at the end of the 1960s, selective liquid ionic electrodes were used, and calcium was the first to be used.[6]
The scientific name of the drug is-

2-[(*E*)-1-(4-methylphenyl)-3-pyrrolidin-1-yl-prop-1-enyl] pyridine The molecular formula of the drug is $C_{19}H_{22}N_2$. HCl and its molecular weight are 314.891, and its Structural formula is:[7,8]



This drug is a white powder form that dissolves in water 500 mg. Ml -1 its melting degrees is 60°C.

Triprolidine hydrochloride is currently involved in producing a drug Samafed pills in the form of tablets 500 mg. produced by The State Company for Drugs Industry & Medical Appliances Samarra. The drug is used to relieve the symptoms of catarrh and colds.[9,10] Because of the importance of the drug, medically, that is estimated by many different analytical methods such as spectral methods, liquid selective electrodes method, electrical methods, and high-performance liquid chromatography (HPLC) technique. Selective electrodes of this drug were manufactured in this research and used for estimation by voltage measurement.

MATERIALS AND METHODS

Instruments

1- Voltage and pH meter device

JENWAY PH/mV meter 3310 (Orion 91-02) model. Japan

2- Calomel electrode

Calomel Reference Electrode Fisher Scientific Company Japan

3- Internal reference electrode (Silver-Silver Chloride)

Silver-Silver Chloride Electrode as internal reference electrode (Orion 90-02).

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4- Hot Plate with Stirrer

JENWAY Hot Plate with Stirrer.

5- Sensitive balance (four decimal places).

Precisa 220 A Swiss made Swiss

6- Ultrasonic water bath.

Ultrasonic KARL KOLB-Germany Made Germany

Chemical Materials

The used materials are highly purified and manufactured by Fluka and BDH Companies, and deionized distilled water was used.

Sodium Tetra Phenyl Borate (10^{-1}) Molar Solution

Prepared by dissolving 3.4223 grams of the substance in water in a small Beaker and adding to a volumetric flask 100 mL volume and complete the volume with water to the mark.

Pharmaceutical Substance Solution TRP (10^{-1}) Molar

The CIP stock solution prepared with concentration 10^{-1} molar by dissolving 3.1489 g in a 100 mL volumetric flask and completing with water to the mark. Other standard solutions (10^{-5}–10^{-2}) molar were prepared by dilution.

The Solution of Samafed Tablets (500 mg) with Concentration (10^{-2}) Molar

It was prepared by dissolving 0.7 g of the content of SAMAXIME tablets (representing the weight of one tablet) in 25 mL volumetric flask in a volume of deionized water and then completing the volume to the mark to obtain the desired concentration.

Preparation of the Drug Substance Complex TRP with STPB Solution

The complex was prepared by adding 3 mL of TRP solution with 1 mL of STPB solution at a concentration of 10^{-1} for each of them with Continuous stirring, forming a precipitate, filtering the precipitate, and washing several times with water, and leaving 72 hours at laboratory temperature 25 °C until dry.

Manufacture of Selective Membrane in the Presence of DBPH Plasticizer

0.45 g of PVC Dissolved in a mixture of 10 mL of acetone and 20 mL of tetrahydrofuran THF) and add to the mixture 0.1 g of the drug complex and prepared above with Continuous stirring until dissolved and using an ultrasonic device, add 0.43 g of plasticizer with stirring Until homogeneity.

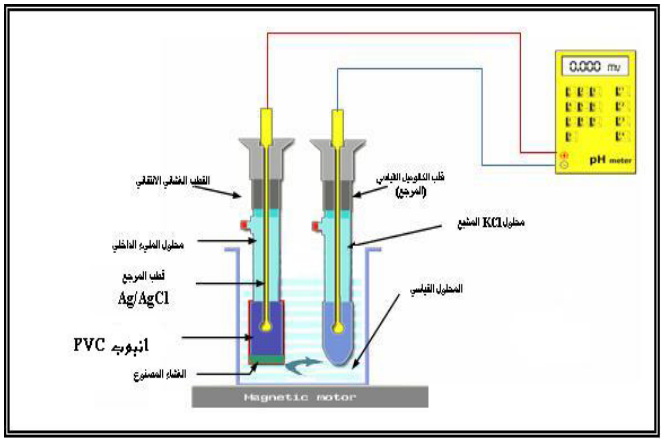

Figure 1: Final shape of the electrode and an electrical circuit structure

Each mixture was poured into Petridish with 10 cm diameter and left until dry for 72 hours at laboratory temperature and evenly. The membrane was carefully lifted by Tong forceps, and the thickness of the membrane was 0.3 mm, which is consistent with Metzger and his group.[11]

Selective Membrane Electrode Structure

A 5 cm long section with an outer diameter of 1.5 cm cut from the PVC pipe. One end was leveled by catch it with a vertical position and moved in a circular motion on a glass plate with a few drops of THF. a circular disk is cut from the membrane with a greater diameter than the outer diameter of the PVC pipe and paste the end of the tube carefully.

The other end of the PVC pipe is connected to a glass tube containing a silver-Silver chloride (Ag-AgCl) electrode and connected to a potentiometer and an insulated wire. The glass tube is filled two-third with an internal filling solution of the drug and immersed for a while in the drug solution, then with the same concentration of the inner filling solution until saturation, and the ion exchange process is completed regularly and in reverse (Figure 1).[12]

RESULTS AND DISCUSSION

The membrane electrodes of TRP drug were constructed, and its preparation relied on the complex of drug with sodium tetraphenylborate STPB as a sensor using plasticizer DBPH with the presence of PVC as a substrate for these electrodes and after the preparation of the TRP-STPB electrode with DBPH plasticizer, the properties of each were studied after fixing the optimum conditions for the best nernst response.

Optimum Conditions

1- Effect of internal filling solution.

An electrode study was performed when the internal filling solution was changed, and the best concentration was 10^{-4} molar which gives the best nernst response as shown in Figure 2.

This concentration gives the best experimental value for Slope and approximation to the theoretical value (29.5 mV/decade), and the results are shown in Table 1.

2- Effect of Temperature

The effect of temperature on the response of the electrode at 10^{-1}–10^{-3} molar concentration of 5 degrees per gradient was studied respectively. So It was found that the best Celsius temperature at which the TRP-STPB was operating was (30–20)°C. The results are shown in Figure 3 with a marked increase in voltage values at higher temperatures, which can

Table 1: The best experimental value of the slope approximates the theoretically calculated value

Concentration (mol/L)	10^{-1}	10^{-2}	10^{-3}	10^{-4}
Dip (mv/decade)	22.0	20.4	16.2	29.4
correlation coefficient r^2	0.968	0.964	0.966	0.994

be attributed to the increased movement of drug solution molecules inside and outside the electrode and an increase in the surface area of the manufactured electrode membrane.

3- Effect of pH

The effect of pH on STPB TRP electrode response was investigated separately using an internal filling solution of 10^{-4} molar concentration of the outer solution concentrations of the drug (10^{-3}, 10^{-1}). It was found that the best pH of the electrode TRP-STPB can be worked with a range between (3.5-5.0) and the results are shown in Figure 4 has been neglected high pH values due to the formation of white precipitate with the drug when using a basic solution in addition to sintering the membrane with gives voltage values are irregular, and the possible cause is the alkaline error occurs.[13]

4- Life of Electrode

The life of the electrode was estimated by recording the potential difference using the standard drug solution of 10^{-1} molar concentration every two days, respectively. The life of the electrode TRP-STPB was about fourteen days and then showed a negative deviation, as shown in Figure 5. The end-of-life of the electrode is generally due to loss of membrane contents (active and plasticized material).[14]

5- Standard Curve

After optimal conditions were determined, the standard curve was drawn (Figure 6) for the electrode, and the detection limit for the TRP-STPB electrode was extracted, and it was 2.5×10^{-8} molar as shown in the figure below.

6- Selectivity Measurements

A mixed solution determined the coefficient of selectivity of the TRP-STPB electrode with DBPH plasticizer. The electrode showed high selectivity to the drug without being affected by the selected crossed ions. This is illustrated by the selectivity coefficient values less than one.[15]

b- Quantitative analysis of the 500 mg samafed tablets constitutional Method[16]

20 microliters of 0.05 mg/mL solution of triprolidine hydrochloride were injected by taking the average weight of ten tablets dissolved in the mobile phase consisting of 0.025 molar phosphoric acid at PH = 3 and acetonitrile at the rate of (6.5: 4.4) mL, respectively. With flow fast 1.5 mL/min from the mobile and column type C18, the response (peak area) was recorded at the wavelength l_{max} = 278 nm.

The unknown was calculated by injecting 20 microliters at the same concentration of the standard solution, and the response was recorded, and the peak area was calculated. The results are shown in Figures (3-6-A) and (3-6-B),

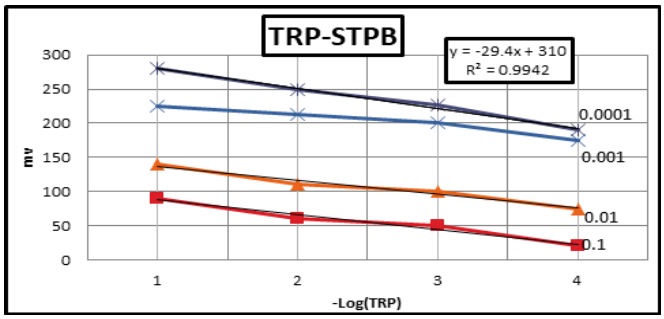

Figure 2: Effect of internal filling solution using external solutions in four different concentrations

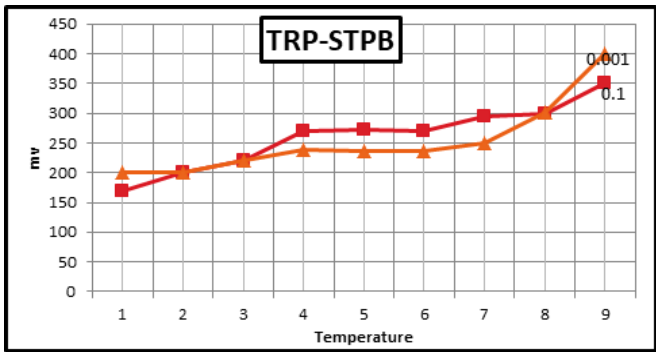

Figure 3: Effect of Temperature on Electrode Response Using External Solutions in Two Different Concentrations

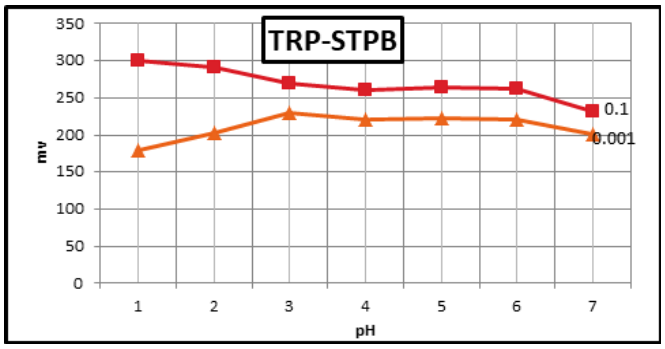

Figure 4: Effect of acidic method on electrode response

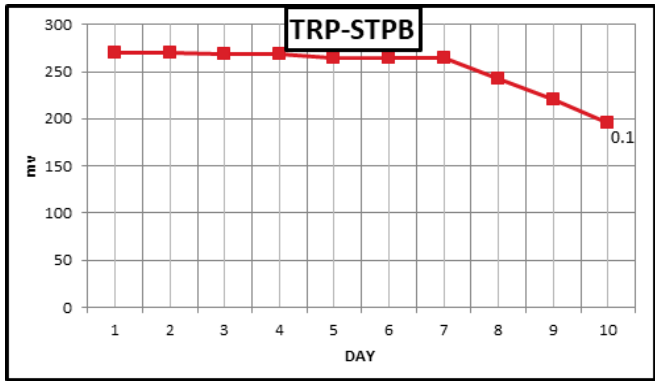

Figure 5: Effect of time on the life of the electrode

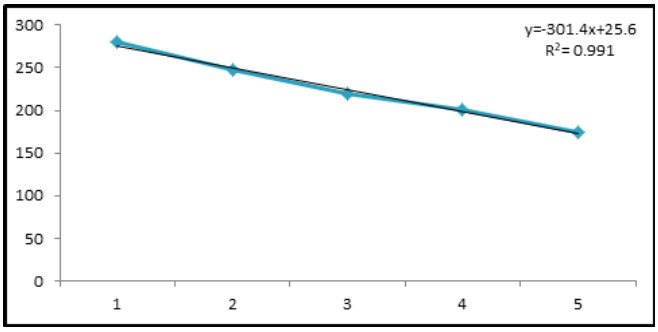

Figure 6: The standard curve of the electrode

Table 2: Results of applications by the direct method of the electrode

Centennial redemption Recovery %	*Standard deviation RSD%*	*The electrode response of the straight line equation*	** Electrode response mv*	*Response time (second)*	*Molar concentration*	*Electrode type*
105.57	0.08	211.22	223	43	10^{-3}	DRUG

and the concentrations were calculated by comparison as follows:

$$\% = \frac{Peak\ area^{*}\ of\ test}{Peak\ area^{*} of\ standard} \times 100$$

Application

The Triprolidine drug in anti-samafed 500 mg was estimated by applying the direct analysis method (proposed method) and the standard method (constitutional) measuring 20 ml for each of the prepared solutions after fixing the optimal conditions and using the TRP-STPB-DBPH electrode. From the standardization curve, the concentration of the drug was extracted, and the results are shown in Table 2.

Estimate of Results

The active substance in samafed tablets was analyzed according to the standard constitutional method[12] at a concentration of 0.25 mg/mL and from the area of the curve measurement for the technique (HPLC), and the calculation of the percentage of recoverability of four readings was equal 99.6% and the standard deviation S = 0.32.

CONCLUSIONS

The research shows the success of manufacturing selective electrodes for TRP with STPB with DBPH plasticizer and using PVC as the basis of these electrodes.

These electrodes can be used to estimate the above drug with a wide linear range of concentration and low detection limit, and good selectivity. The drug was estimated in the samafed with a retrospective was 105.57%.

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