APPLICATIONS OF AI IN THE ELECTROCHEMICAL ANALYSIS OF REDOX TITRATIONS

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Abstract
AI can be effectively use in the electro-analytical techniques Such as in conductometric titration, potentiometric titration, pH metric titration. With the help of different AI tool, we can draw different possible diagrams which solve the different problems of electro-analytical techniques.
Keywords: *conductometric titration, potentiometric titration, pH metric titration, AI*

Introduction

Electrochemical Methods of Analysis: These are interaction those methods between the electricity involves the chemical reactions. These methods are mainly used for measurement of electric parameter like current, potential, charge by using chemical interactions (concentration of ions). It is based on that; these chemical solutions directly/indirectly react with electrodes. Also used for detection of end point of titrations.

Redox:

It is the due to measurement of conductivity of a solution the mobility (movement) of cations and anions towards respectively electrodes. It is basically used for the measurement of conductance by using instrument Redox

Conductance: It is the ability of solution electric current. It is denoted by Conductance [G] = 1/Resistance [R] to pass the G. It is inversely proportional to the resistance. It is depending on: 1) Concentration of ions. 2) mobility/movement of ions. 3) Temperature of solution. The main principle of Redox is that the ions present in for the solution in flow so, when these ions the conductance starts. It moves a electric chemical cells are current. Towards anode & cathode and conductance starts. Terms related to Redox **Conductivity** follows ohm's law 1) Ohm's law It states that the strength of current (I) passing through conductor is directly proportional to potential difference and inversely to resistance.
$I = V/R$ 2) Specific resistance the resistance (R) of the conductor is directly proportional to the length (l) and inversely proportional to its area of cross section (a).

$R = P\, l/a$ 3) Specific conductivity (K) It is the inverse of specific resistance K (Kappa) $=1/p$.

Problem Statement:

In Redox titration platinum electrode is used whose thickness is greater so to Analysed any solution in Redox titration are required large quantity of solution and result in the digital Redox titration are not accurate.

Literature Review:

Naved Azum, Malik Abdul Rub, Maha Moteb Alotaibi, etal Analyzed "Synergistic Interaction Between Cationic Novel Gemini Surfactant and Non-ionic Conventional Surfactants in Aqueous Medium" Concluded that The surfactants are utilized in a wide spectrum of industries. Almost in all applications, surfactants are used with different kinds of additives to obtain better action of the mixture over a single one. The combination of two or more surfactants exhibits pronounced synergistic effects by reducing the cmc values of the mixture. Keeping the view of the superiority of gemini surfactants on the micellar front, the mixed surfactants behaviour of gemini surfactants with two non-ionic surfactants has been explored in the current study. Following conclusions have been drawn from this study: The non-ideal behaviour of current mixed systems has been confirmed by the lower experimental cmc values than the ideal one; The cmc values decrease with the mole fractions of novel surfactants; The strong synergistic or attractive interaction was confirmed by the negative values of the interaction parameter at all mole fractions; The values $\Delta G\, m$ and $G\, e\, x$ are negative, which designated that the creation of mixed micelle is spontaneous and thermodynamically stable. The stability of the current mixed system is also

supported by the interaction parameter; the exothermic nature of the current mixed system is governed by the negative values of enthalpy change ($\Delta H\,m$). The positive entropy values can be considered as the driving force of micelle formation.

Marı́a Jose´ Lavorante , Juan Isidro Franco Analyzed "Redox titration as a technique to determine variation in conductivity in perfluorosulfonic acid materials for fuel cells and electrolyzers" Concluded that "In this research work, both experiments developed, reaction kinetics and Redox titration, showed that the working temperature is be properly maintained with a thermostat and remains stable to achieve determinations that can be compared with each other and avoid the fluctuation of the conductivity. The nitrogen bubble system presents good results, not only because it is one that can be carried out within the thermostat, but also offers the process a liquid medium with feature showing a tendency to isotropy. More work has to be done in this respect to guarantee isotropy, studying the flow of gas delivered into the system and the best position of the bubbler. A suitable agitation throughout the experiment provides the liquid medium isotropic characteristics. This is a key condition for studying these systems ensuring the homo genetic of the medium in which the membrane under study is immersed. If the medium is not isotropic, values obtained are unreliable for the determination of total acid capacity or equivalent weight. The best operational conditions are: working at the same temperature using a thermostat and suitable agitation of the system throughout the determination. The study of the kinetics allows calculating the half-life period that abruptly reduces the long periods of time that have to wait to determine the value of TAC using other techniques. The time required to analyse a reaction with a half-life period of 30 min is of 6 h (for the whole experiment) in contrast to 24 h to acid–based titration to reach only reaction equilibrium, then the time needed to make the titration itself has to be taken into account. The sample does not necessarily have to be pre-treated like the cases of the other Redox titrations mentioned and the acid-based titration, and as a direct consequence the time of operation is reduced. The technique proposed offers advantages if it is compared with other techniques such as acid–base titration. As the determination does not need the presence of an indicator, it does not have the possible determination error for the wide range of pH that an indicator presents. The technique designed does not need to dissolve the sample of polymeric material to be studied, so it is does not incorporate contaminants that can alter the results. The value of the total acid capacity can be obtained avoiding the pre-treatment of the material, and as a consequence the contamination of the sample with other types of electrolytes that can affect the results of the Redox titration.

Marshall Frye, Amalie Atassi, David Mazyck etal Analysed "Effect of degree of sulfonation in nanocellulose / chitosan composite on adsorption of cationic dye as opoide simulant" concluded that From these results, it can be concluded that sulfonated nanocellulose is a sustainable material that can be used to remove amine dyes from water. The Victoria blue R dye was adsorbed by all three samples, but increasing the concentration of the sulfonate groups increased the efficacy of the adsorbent, confirming the hypothesis. Based on the results from the adsorption kinetics and isotherms, it is concluded that the dye is adsorbed in a single layer fashion and that the interaction between the dye and the filter is through chemical adsorption. The sulfonated nanocellulose had a higher maximum adsorption value than those of activated carbon and magnetic microparticles, leading to the conclusion that sulfonated nanocellulose is a better adsorbent than these materials for Victoria blue R. Due to the similarity of this amine dye and opioids, it is inferred that sulfonated nanocellulose is likely to be effective at filtering out opioids. Future studies should be done on the ability of sulfonated nanocellulose to filter out specific opioids water. It would also be beneficial to test the filter's ability to sequester other common drugs, such as nicotine and caffeine, as these are not easily removed during normal wastewater treatment. All factors considered, this sulfonated nanocellulose filtration system has potential towards cheap and renewable sequestration of opioids from water. This would address an emerging contaminant that continues to pollute drinking water and is affecting wildlife.
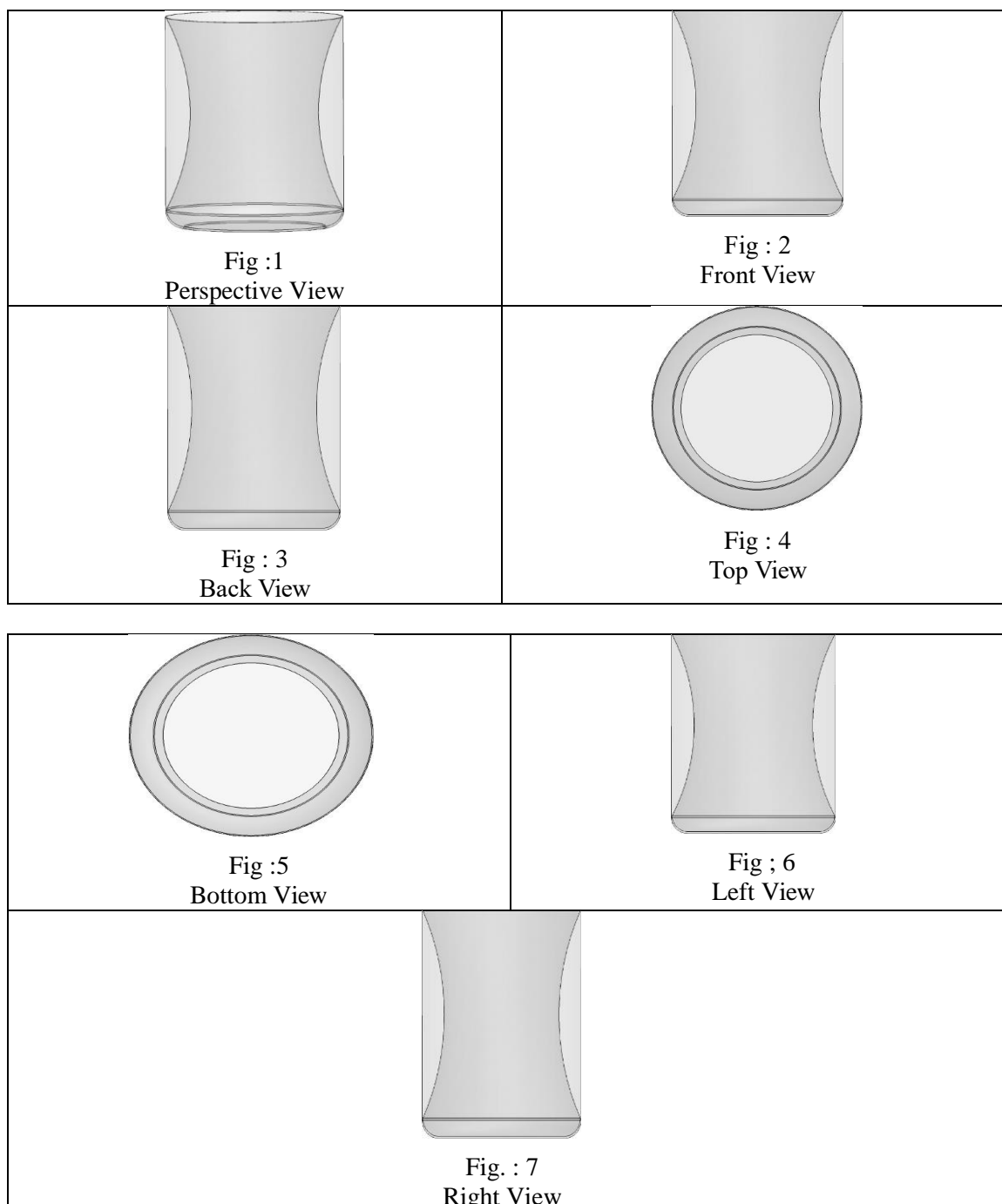
Adolfo eduardo Obaya Valdivia, Carlos Montaño Osorio, Yolanda Marina Vargas-Rodriguez Analysed "Redox Titration of Metformin Hydrochloride: Simulation and Experiment" Concluded that Metformin hydrochloride was quantified, obtaining 493 ± 15 mg of active ingredient per drug tablet. Conductimetry presented the lowest percentage of relative standard deviation, having the smallest dispersion and a greater concordance degree within the obtained results. In such a way, this is the most reliable technique since the equivalence point can be easily detected through a Sharp change given by the ions increase in conductivity after the equivalence point. Confident intervals for the analyte content include the quantity reported by the manufacturer, showing that quantification is precise. Redox titration curves were simulated, which accurately describe the data

behaviour experimentally obtained, being the Redox technique reproducible. This type of experiment teaching proposal may be used in the teaching and learning of qualifications conductivity through the strategy of cooperative group in which the group can be divided into three sections, a section would work the visual titration, another section the potentiometric titration and another

section Redox titration. At the end the three sections discuss their results and establish general conclusions of the group on the experiment.

Research Work:
Acids and bases have free had hydrogen ion and hydroxyl ions respectively.

Fig :1
Perspective View

Fig : 2
Front View

Fig : 3
Back View

Fig : 4
Top View

Fig :5
Bottom View

Fig ; 6
Left View

Fig. : 7
Right View

The novelty resides in the shape and configuration of the **"Cabinet of Electrode for Electrochemical Analysis"** as illustrated.
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The novelty resides in the shape and configuration of the **"Cabinet of Electrode for Electrochemical Analysis"** as illustrated.

Conclusion:

The aim of research work is to resolve the problem in the Redox titration silver chloride electrode/Glass electrode/platinum electrode is used whose thickness is greater so to analyzed any solution in Redox titration required large quantity of solution and results in the digital Redox titration are not accurate, Hence to overcome this problem the shape of the beaker is designed in such way that above problem is resolved completely. Design of beaker is designed using different AI tools, Beaker Different views are shown in the above diagram.

Fig : 2 - Front

Fig : 3 - Back View

Fig : 4 – Top View

Fig : 5 - Bottom View

Fig : 6 - Left View

Fig : 7 - Right View

Not only existing problem resolved but also it is cost effective.

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