

## STUDY ON VOLUMETRIC ANALYSIS OF ORGANIC COMPOUNDS USING MODIFIED CARBON PASTE

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### Abstract

*Volumetric analysis is used to measure medication concentrations in samples. It's used in organic chemistry to measure a sample's organic component concentration. Modified carbon paste electrodes improve voltammetry analysis of several compounds. This study used modified carbon paste electrodes for volumetric analysis of organic compounds. A carbon paste-organic chemical solution mixture was used to make the modified carbon paste electrode. The electrode performed volumetric analysis after applying the mixture. The approach determined the concentration of several chemical substances. Results showed that the altered carbon paste electrode was suitable for volumetric analysis of organic compounds.*

### Introduction

Processes known as electrochemical reactions include the transfer of charge from one atom or molecule to another during the reaction. The measuring approach is predicated on the detection of the electrical current that is carried by the electrons that surround the heavy nuclei that are responsible for the formation of atoms and molecules. Electrons are also the particles that are accountable for the flow of electric currents and they are the ones being discussed here. The two reaction sites in electrochemistry are linked by a wire that enables electrons to move between them; this is an essential component of the area of study known as electrochemistry. Between the oxidation phase and the reduction phase of the process, there is a significant gap in terms of the atomic structure of the reactants and products. Both stages are separated from

one another in this particular manner.

Yet, without it, it is difficult to determine the flow of electrons since it takes place across such a small region. This makes it difficult to determine the flow of electrons. This may be performed by using two electrodes that are separated from one another by an electrolyte phase. These electrodes are referred to as an anode and a cathode. There is nothing more to an electrolyte phase than a phase in which ions that are moving through the electrolyte phase transfer charge to one another. Before letting electrons from the oxidizable solution's components into the electrode, it is necessary to first extract electrons from the solution's constituents so that the oxidation process may take place at the anode. Only then can those electrons be allowed to enter the electrode. During the reduction process, electrons are concurrently transmitted from the cathode to the different components of the reducible solution. This happens since the cathode remains at the same potential throughout the operation.

Electrochemical methods are a crucial tool for the discovery of chemical pathways and systems for a variety of different reasons. There are a lot of different explanations for this. Electrochemical reactions are frequently more friendly to the environment than chemical reactions. This is the case in terms of the potential contaminants, cost issues for chemical processes, strong selectivity of the goal result, and most notably the

determination of low quantities of chemicals, among other factors. Electrochemical processes are of interest to researchers for a broad range of different reasons for a number of different reasons.

They may be interested in learning more about the redox nature of the compounds in order to learn more about the thermodynamics, kinetics, and reaction mechanisms of the compounds of interest, as well as the type and number of electrons involved in electron transfer, the nature of the products formed, and the analysis of trace amounts of metal ions or organic species. In addition, they may be interested in learning more about the nature of the products formed. In addition to this, people can be curious to find out more about the characteristics of the items that are created.

As a result of the presence of free ions, ionized molecular groups, or electrically polarized biomolecules, a great number of the organic compounds that play a significant role in biology are capable of being oxidized or reduced by means of electrochemical processes when a potential is applied. Electroactivity is the capacity to go through electrochemical oxidation or reduction in response to an applied electric current. As a result, electrochemical approaches are the ones that are the most useful when it comes to examining the redox properties of recently discovered medications. This might also provide information on the rate of metabolism. In most cases, the pharmacological activity and the molecular structure are connected to the electrochemical data in some kind. The study of the electrochemistry of physiologically active organic molecules may provide light on the biochemical processes that take place in live organisms as well as the ways in which those processes interact with one another.

### **Voltammetry**

Electrochemical processes may be broken down into three primary subfields: voltammetry, potentiometry, and coulometry. Voltammetry is the most fundamental of the three. For the purpose of data collection on an analyte, the electroanalytical method known as voltammetry is used. Voltammetry involves the measurement of currents that are produced when a voltage is applied. Voltammetry is the measurement of currents that are produced in response to the application of voltage. Alterations may be made to the potential at will, and these modifications can either be continuous or progressive depending on their nature. Jaroslav Heyrovsky was a scientist who made substantial contributions to the development of voltammetry. In 1922, the Nobel Prize in Physics was bestowed upon him for his creation of polarography, for which he was granted the prize.

The microelectrode in the process of polarography, which is a subset of voltammetry, is a mercury electrode, and it is placed at a decreasing potential (DME). The vast majority of the time, it looks as if a mercury-based electrode is dropping. Polarography provided a strong basis for the development of a variety of different voltammetric processes, which were all built upon its foundation. In the early days of voltammetry, the techniques were plagued by a number of drawbacks that prevented their widespread use in the area of analytical chemistry.

The first three-electrode potentiostat that Hickling designed in 1942 had a manufacturing cost of £16. Throughout the 1960s and 1970s, there were significant developments in both theory and instrumentation, as well as the advent of computer-aided and -controlled systems.

These developments happened simultaneously. Because of these improvements, new analytical methods and a higher level of sensitivity have been developed. Voltammetry research has, without a doubt, made significant advances to our knowledge of how electrolysis works, which is one of the most essential aspects of this topic.

### Types of voltammetry

The working electrode material and the potential function that was used to drive the reaction were the primary factors that differentiated the various voltammetric procedures that were applied in voltammetry from one another. These factors were the primary factors that differentiated the various voltammetric procedures that were applied in voltammetry. These are relevant examples for the concepts that are presented below.

- Voltammetry using a linear sweep (LSV)
- Step Voltammetry (SV)
- Voltammetry Square Wave (SWV)
- Voltammetry using anodic stripping (ASV)
- Voltammetry using Cathodic Stripping (CSV)
- Regular pulse voltametry (NPV)
- Diffuse Pulse Voltametry (DPV)
- Rapid Scan Cyclic Voltammetry (FSCV)
- Voltammetry in cycles (CV)

The voltammetric investigation of the electrocatalytic oxidation of tyrosine at a carbon paste electrode that had a poly (threonine) film added to it using genuine samples.

Using the cyclic voltammetric approach and a polymerized threonine film, also referred to as poly (threonine) -film, a

determination of the tyrosine concentration was made electrochemically in a phosphate buffer solution with a pH of 7.0. This was accomplished by employing the method. As compared to an electrode composed of bare carbon paste, this modified carbon paste electrode with a poly (threonine) covering demonstrated exceptional electrocatalytic activity for the oxidation of tyrosine. You may experiment with the number of voltammetric scan cycles as well as the concentration of threonine in order to modify the thickness of the poly (threonine) film.

The present reaction was at its maximum position up until scan number 10, following which it began to steadily diminish until it reached its lowest point at scan number 20. The repeatability and consistency of the modified electrode were both the subject of a research that was carried out. The researchers investigated the relationship between the tyrosine scan rate and the pH of the solution. The results of the cyclic voltammetric tests suggested that the oxidation of tyrosine at the surface of the modified electrode was irreversible.

At the modified CPE with the poly(threonine) layer, adsorption is controlled and takes place via a one electron process. The linear calibration plot between the oxidation peak current and the tyrosine concentration was in the range of  $5 \times 10^{-6}$  to  $1 \times 10^{-5}$  M and  $1 \times 10^{-6}$  to  $2.0 \times 10^{-5}$  M, with correlation values of 0.999 and 0.997, respectively. This was the case across all ranges. This was true across the board for all of the ranges. It was found out by a technique known as differential pulse voltammetry that the lowest measurable concentration

of tyrosine was  $1 \times 10^{-6}$  M. This was determined using the approach. Since the strategy that was presented was successful in determining the quantity of commercially available tyrosine that was present in the sample, there was no need for any pretreatment treatments to be performed on the sample.

**Part-B:** Electrode for Cyclic Voltammetric Determination with Modified Carbon Paste Consisting of a Poly (L-Serine)-film on Tyrosine

In order to get an exact reading of the amount of tyrosine that was in the phosphate buffer solution, it was necessary to create a carbon paste electrode that had been modified with a poly (L-serine) film. This was done so that the reading could be as precise as possible. The fulfillment of this requirement was necessary for the effective use of the cyclic voltammetric approach (pH 2.0).

The oxidation of tyrosine at the electrode surface was determined to be irreversible by the use of cyclic voltammetry in the research. In addition, during the reverse scan, neither a reduction peak nor a modification peak could be seen for either kind of electrode. This was the case even though both should have been there. At the poly (L-serine) film modified CPE, the peak potential of the tyrosine oxidation peak current was altered to have a negative potential of about 50 mV. This alteration was made possible by the modification. In spite of this, there was a significant increase in the peak current of tyrosine oxidation when measured against the naked CPE. This reveals that the electrode that has had a coating of poly(L-serine) put to it is able to detect tyrosine while still preserving its catalytic characteristics.

The poly(L-serine) coating was applied to the electrode so that it could detect tyrosine. It is feasible to obtain the required change in the thickness of the poly-L-serine film by adjusting either the concentration of L-serine or the number of voltammetric scan cycles. Both of these variables may be changed.

It was proven that tyrosine could be recognized in commercial samples even without the use of any pre-treatment by using a poly (threonine)-film modified carbon paste electrode. This was accomplished by analyzing the samples with a poly (threonine)-film modified carbon paste electrode. Because of the very high sensitivity and selectivity that it has, it may be used as a sensor if one so chooses.

Voltammetric analysis is used using a carbon paste electrode that has been coated with MgO nanoparticles in order to evaluate the ezetimibe molecule's electrochemical composition.

A simple electrochemical method was devised for the aim of determining the amount of ezetimibe present in a sample. This technique makes use of an electrode composed of carbon paste that has nanoparticles of magnesium oxide added to it (Eze). At the beginning, in order to produce a homogenous MgONP-modified CPE, 4 mg of MgO nanoparticles were added to a mixture that was composed of 70% graphite powder and 30% silicon oil. This mixture was stirred until the addition of the nanoparticles was complete. After that, this mixture was mixed together.

By using this MgONP-modified carbon-paste electrode, we were able to successfully investigate the electrochemical behavior of Eze in phosphate buffer solution (PBS), which had a pH of 7.0. (CV). Zn entered an irreversible oxidation state when it was exposed to bare CPE, which resulted in the creation of a broad oxidation peak. MgONP-

modified CPE had features of a narrow oxidation peak, in contrast to untreated CPE, which included a greatly increased peak current and a negatively shifted peak potential. This reveals that treating CPE with MgONP leads to the development of electrocatalytic activity, which is essential for the oxidation of Eze. Acetonitrile (ACN) gave the best oxidation peak current responsiveness, had a peak shape that was well defined, and had a peak potential of 10 west when it was explored as the sort of solvent that was used to dissolve the Particles. This was discovered when it was looked into. In addition to assessing the effects that pH and scan rate had on the MgONP-modified CPE, it was also determined how the concentration of the modifier had an effect on the end product. It was observed that there was a linear link between the two variables since the correlation between the anodic peak current and the Eze concentration in the range of  $2 \times 10^{-10}$  to  $2.5 \times 10^{-10}$  M had a value of 0.999.

This indicated that the association was very strong. It was established via the use of a differential pulse voltammetric method that the detection limit (10D) and the quantification limit (10Q) at MgONP-modified CPE were, respectively,  $5 \times 10^{-10}$  and  $2 \times 10^{-10}$  M. These values were determined by comparing the two. Both of these limitations were found to be rather low after investigation (DPV). It was possible to identify Eze in test samples of generic drugs by following the approach that was presented. Developing a very sensitive voltammetric sensor for the detection of ions is made a great deal easier by the fact that the CPE was modified with MgONP. This is because it has a high sensitivity, a low detection limit, and it is simple to construct. In addition, the detection limit is low.

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