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THE REVIEW ON DIFFERENT MEHOD FOR THE ESTIMATION OF GLYCOLIC ACID

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ABSTRACT :

Glycolic acid (GA), a widely used alpha hydroxy acid, is increasingly significant in cosmetic and pharmaceutical industries. Accurate and reliable methods for the estimation of GA are crucial to ensure product quality and efficacy. This review explores various analytical techniques for GA quantification, including titration, spectrophotometry, chromatography, and newer, advanced methods. Emphasis is placed on the sensitivity, accuracy, and applicability of each method.

Keywords: Glycolic acid, Estimation methods, Chromatography, Spectrophotometry, Titration, PLC

INTRODUCTION :

Glycolic acid (GA) is the simplest of the alpha hydroxy acids (AHAs) and is extensively used in skincare formulations due to its exfoliating properties. Its chemical properties, such as small molecular size and high water solubility, enable deep penetration into the skin. As a key ingredient in cosmetic and pharmaceutical products, the accurate quantification of GA is critical. This review discusses a variety of methods developed over time to estimate glycolic acid,

1. TRADITIONAL METHOD OF ESTIMATION

a.TIRIMETRIC METHODS

Titration is a classical technique used for the estimation of glycolic acid. The titration of GA Typically involves using a standard base solution, such as sodium hydroxide (NaOH), and Phenolphthalein as an indicator to observe the endpoint.

NTAG ES :

Simple, cost-effective, and requires minimal instrumentation.

DISADVANTAGES:

Less accurate in complex formulations and subject to errors in detecting the Endpoint.

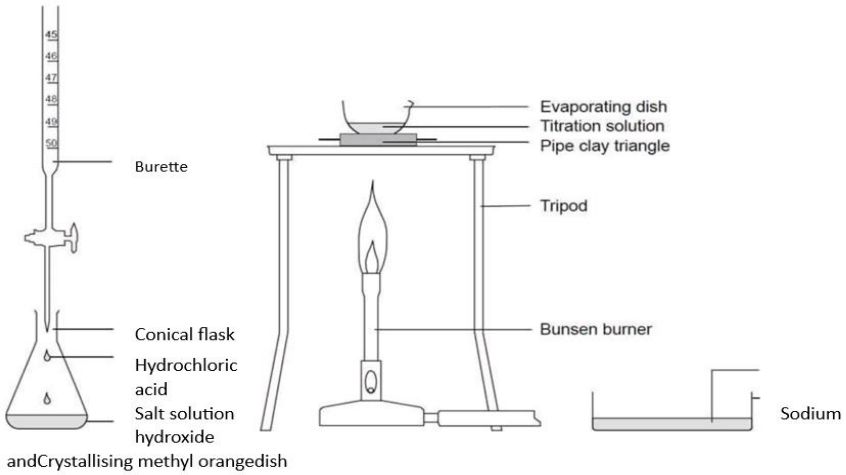


Fig. Titrating Sodium Hydroxide With Hydrochloric

b. GRAVIMETRIC ANALYSIS

Gravimetric analysis involves the measurement of GA by precipitating it and weighing the precipitate. While the method is theoretically sound, it is rarely used today due to its labor-intensive nature.

ADVANTAGES:

High precision in simple solutions.

DISADVANTAGES:

Time-consuming, difficult to apply in complex mixtures

2. ANALYTICAL TECHNIQUES :

A.SPECTROPHOTOMETRIC METHODS

a.UV-VlSABLE SPECTROPHOTOMETRY

UV-visible spectrophotometry is a widely used method for the estimation of GA. It involves Measuring the absorbance of GA at a specific wavelength, often after a reaction that produces a detectable chromophore.

ADVANTAGES:

Relatively simple, non-destructive, and suitable for routine analysis.

DISADVANTAGES:

Requires derivatization in some cases, which can introduce errors.

a

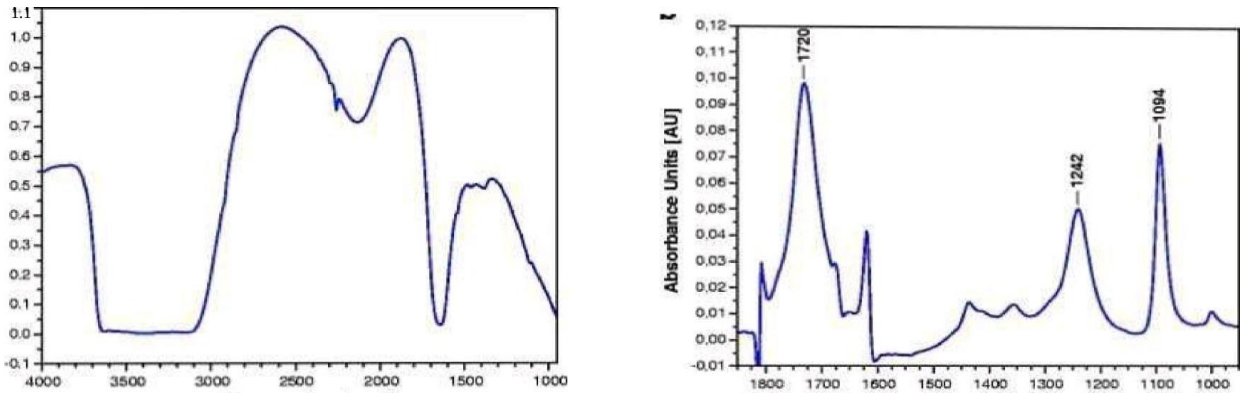


Fig:Determination of Glycolic Acid In Cosmatic

B.CHROMATOGRAPHIC METHODS

a. Hig-hPerformance Liquid Chromatography (HPLC)

HPLC is considered the gold standard for glycolic acid estimation due to its high sensitivity and accuracy. It separates GA from other components based on their interaction with the stationary and mobile phases.

ADVANTAGES:

High precision, suitable for complex matrices.

DISADVANTAGES:

Expensive, requires sophisticated instrumentation

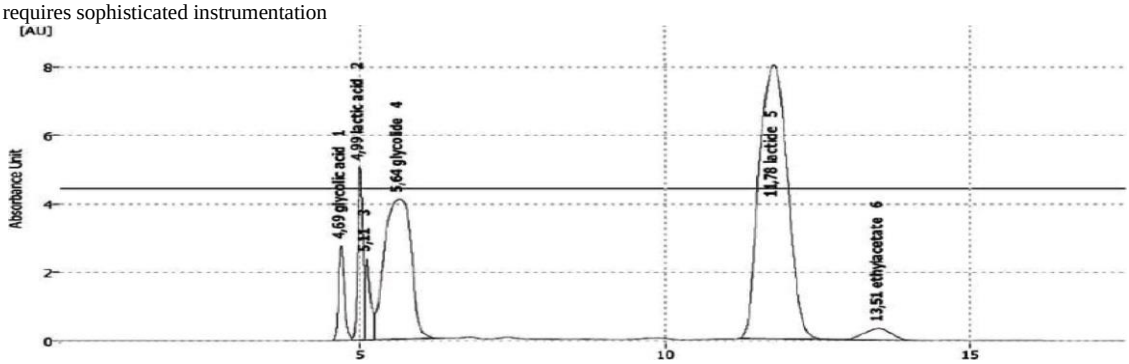


Fig:HPLC Separation of Glycolic Acid

b. GAS CHROMATOGRAPHY (GC)

Gas chromatography can also be employed for glycolic acid analysis after derivatization to increase volatility. GC provides excellent resolution, especially when coupled with mass spectrometry (GC-MS).

ADVANTAGES:

High sensitivity, useful for trace analysis.

DISADVANTAGES:

Requires derivatization, which can be time-consuming.

c. ENZYMATIC METHODS

Enzymatic assays use specific enzymes to catalyze reactions with glycolic acid, allowing for its quantification. This method is particularly useful in biological samples.

ADVANTAGES:

High specificity, environmentally friendly.

DISADVANTAGES:

Expensive reagents and I enzyme instability.

3.ADVANCED ANALYTICAL TECHNIQUES

a.CAPILLARY ELECTROPHORESIS (CE)

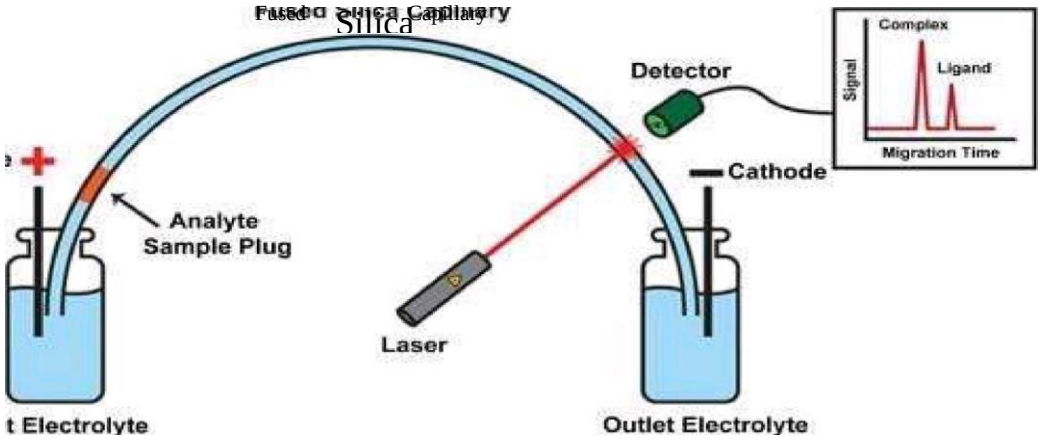
Capillary electrophoresis is an emerging technique for the estimation of glycolic acid. It offers high resolution, fast analysis, and requires minimal sample preparation.

ADVANTAGES:

Quick, requires small sample volumes.

DISADVANTAGES:

High initial cost of equipment.



Anode +

Inlet Electrolyte Reservoir **Outlet Electrolyte Reservoir**

Fig. Capillary Electrophoresis (CE)

DISCUTION :

Each method reviewed has specific strengths and weaknesses. Traditional methods such as titration are simple but lack precision. Spectrophotometric methods are popular in routine analysis, while chromatography, particularly HPLC, is ideal for more complex samples. Emerging techniques like capillary electrophoresis and enzymatic assays show promise for the future due to their speed and specificity.

CONCLUSION :

The choice of method for glycolic acid estimation depends on the complexity of the sample, required sensitivity, and available instrumentation. While HPLC remains the most reliable technique, advanced methods such as capillary electrophoresis and enzymatic assays are gaining traction due to their

efficiency and environmental benefits. Future research may focus on developing even more refined techniques, particularly for real-time and in-situ analysis.

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