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First Order Development of New Molecule Levodopa

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Abstract
The UV Spectrophotometric method was used to create a new approach and validate it for the measurement of levodopa. It uses the first derivative to calculate the drug's concentration. The current work uses a software model and a single beam UV-Vis Spectrophotometer for estimate. Using methanol as the drug's solvent, the spectrophotometric method for estimation employed the first derivative spectrophotometric method for analysis. The First Order Derivative for Levodopa absorbance maxima has a wavelength range of 200–280 nm. Beer's law binds levodopa within the concentration range of 10–40 µg/ml. When taken orally, levodopa [(-)-3- (3,4-dihydroxylphenyl)-l-alanine] is a catechol-related substance that functions as a neurotransmitter and a precursor to dopamine. It enters the brain and is enzymatically decarboxylated to Dopamine.However, negative side effects like nausea, vomiting, and heart arrhythmias are also brought on by high dopamine levels.

I. Introduction

In order to obtain mutually qualitative and quantitative information from spectra that contain unresolved bands, derivative UV spectrophotometry is a widely used analytical technique. First or higher derivatives of absorbance according to wavelength are used for both qualitative and quantitative analysis.UV Spectroscopy is also known as electronic spectroscopy; this technique is simple and rapid, and applicable to small quantities of compounds. The fundamental law of spectroscopy techniques that provide the quantitative spectrophotometric analysis which is based on the Beer-Lambert's law. [1-2]

The review paper addresses derivative UV-spectrophotometry's theoretical features. When the first and second derivatives of the transmission spectra are used in relation to wavelength, the approach becomes significant. The known numerical derivatives and the generated optical derivatives are compared.It is demonstrated how to determine single and multicomponent analyses using UV derivative spectrometry. It has been demonstrated that derivative spectrophotometry may increase determination's sensitivity and selectivity.

Principle of Ultraviolet and Visible Spectrophotometer

It is based the principle of absorption of UV & Visible light by chemical compounds, which result in production of different spectra and the spectra arise from the transition of an electron within a molecule from ground state to excited state. When the molecules absorb UV radiation frequency the electron in that molecule undergoes transition from ground level to higher energy level. [3]

Beer's Law

The intensity of beam of monochromatic light decreases rapidly with the increase in concentration of the absorbing substance or it state the when the light beam is passed through the solution of absorbing substance, the rate of decrease of intensity of radiation with thickness of absorbing solution is proportional to intensity of incident as well as the concentration of solution or Beer's law states that concentration and absorbance is directly proportional to each other.[4-5]

Lambert's Law

When the beam of light from radiation source is allowed to pass through a transparent medium, the rate of decrease of intensity with the thickness of medium is directly proportional to the intensity

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of light or the rate of decrease of intensity of the Monochromatic light with the thickness of medium is directly proportional to the intensity of incident light. [6-7] The Beer and Lambert law are normally combined in relation-

$A = -\log_{10} P/P_0 = abc$

Where,

A = absorbance / optical density P = radiant power / intensity

a = absorptivity / extinction coefficient

b = length of the beam in the absorbing medium c = concentration of the absorbing species [8]

However in pharmaceutical analysis the important application of UV-Vis Spectrophotometer is quantify the drug substances. On the basis of Absorption law of Beer-Lambert qualitative analysis is done by the measurement of absorbance (A) of compound, which may be written as-

$A = \log (^{Io}/_{I}) = \varepsilon bc$

Where,

Io = Intensity of incident light,

I = Intensity of transmitted light,

ε = molar absorption coefficient,b = the path

c = concentration of light by the absorbing compound [9]

Derivative Spectroscopy

It is a spectroscopic technique that differentiates spectra's mainly in IR, UV-Visible absorption and Fluorescence spectrometry [10]

Spectral differentiation

As a qualitative method that distinguish small variation between almost similar spectra's.

Spectral resolution enhancement

Overlapping spectral bands gets resolved to simply estimation the number of bands and their wavelengths.

Quantitative analysis

It facilitates multicomponent analysis and corrects the irrelevant background absorption. Derivative spectroscopy method forms the beginning of differentiation or resolution of overlapping bands; the vital characteristics of derivative process are that broad bands are suppressed relative to sharp bands. [10]

First order derivative spectrum

Spectra obtained by derivatizing zero order spectrum once. It is a plot of change of absorbance with wavelength against wavelength10 i.e. rate of change of the absorbance with wavelength,

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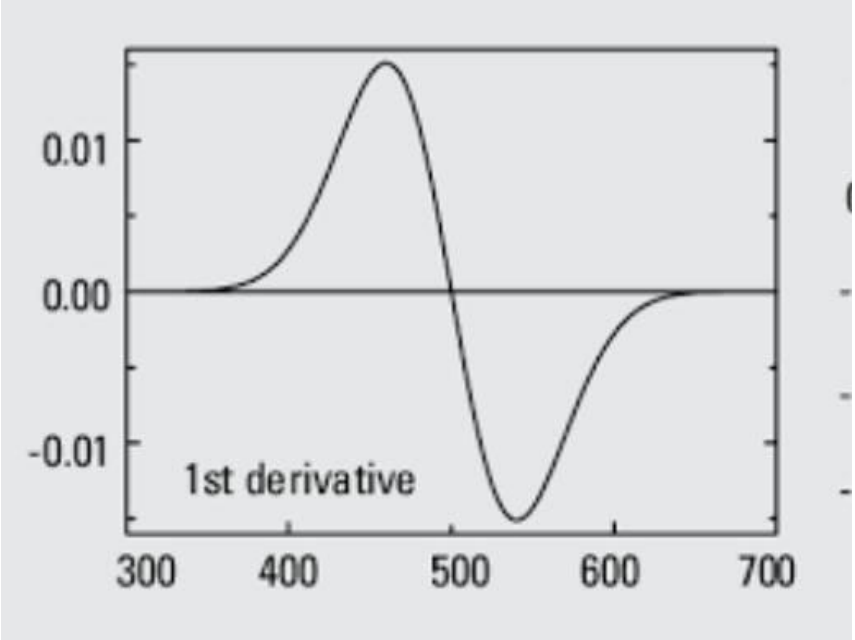

Fig No. 1: Illustration of First Order Derivative Spectrum

Standard calibration Curve of Levodopa using UV-VisibleSpectrophotometry.[11]

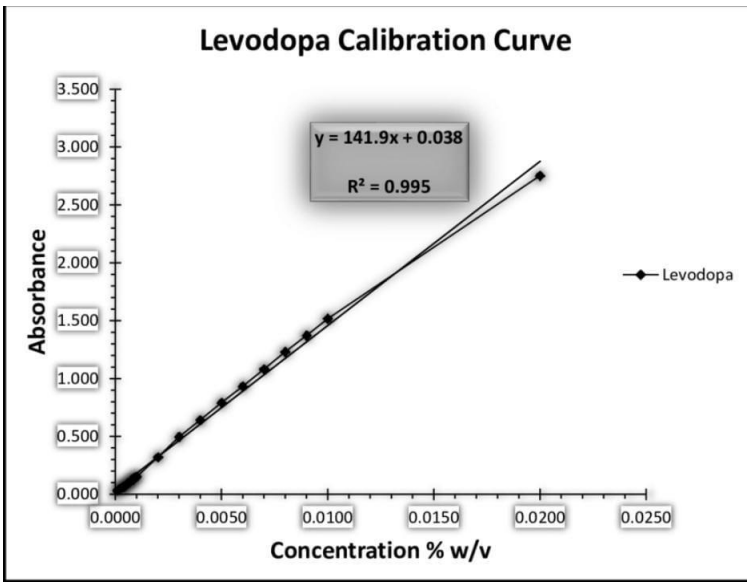

Fig No.2: Standard calibration Curve of Levodopa using UV-Visible Spectrophotometry at 280nm and 0.1 M HCL in the reference cell. The correlation coefficient is 0.995 (y = 141.9x + 0.038)

II. Conclusion

The development first-order derivative spectroscopic method proved to be simpler in procedure and produced more accurate results. The correlation coefficient was 0.995 when the above first order derivative was calibrated using standard levodopa at 280 nm in 0.1 M HCL as the reference.

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