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Different signal processing techniques of ratio spectra for spectrophotometric resolution of binary mixture of bisoprolol and hydrochlorothiazide; a comparative study



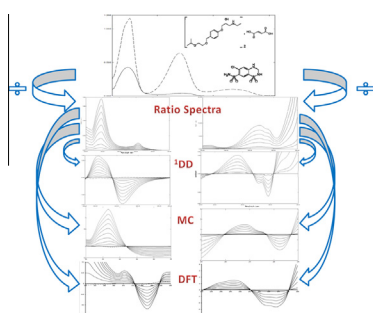
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HIGHLIGHTS

- Savitsky–Golay filter and Wavelet Transform as approaches for derivative calculation.
- Fourier Transform and Mean Centering versus traditional derivative algorithms.
- Simple, accurate selective and precise spectrophotometric methods for binary mixtures.
- Methods validated as per ICH guidelines, parameters found to be within the limits.

GRAPHICAL ABSTRACT



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ABSTRACT

Five signal processing techniques were applied to ratio spectra for quantitative determination of bisoprolol (BIS) and hydrochlorothiazide (HCT) in their binary mixture. The proposed techniques are Numerical Differentiation of Ratio Spectra (ND-RS), Savitsky–Golay of Ratio Spectra (SG-RS), Continuous Wavelet Transform of Ratio Spectra (CWT-RS), Mean Centering of Ratio Spectra (MC-RS) and Discrete Fourier Transform of Ratio Spectra (DFT-RS). The linearity of the proposed methods was investigated in the range of 2–40 and 1–22 µg/mL for BIS and HCT, respectively. The proposed methods were applied successfully for the determination of the drugs in laboratory prepared mixtures and in commercial pharmaceutical preparations and standard deviation was less than 1.5. The five signal processing techniques were compared to each other and validated according to the ICH guidelines and accuracy, precision, repeatability and robustness were found to be within the acceptable limit.

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Introduction

UV–VIS absorption spectroscopy is a well established technique for rapid and accurate determination of analytes without prior separation, if the interferences can be eliminated. Manipulation of ratio spectra has been the basis of some analytical procedures to

eliminate the interference between the spectra of different components.

The ratio spectra were firstly used by Blanco et al. [1,2] for the spectral analysis. After that many signal processing techniques were combined with the ratio spectra for the spectrophotometric resolution of overlapped spectra. Salinas et al. [3] modified the original equations of Blanco and developed the first derivative of ratio spectra method for analysis of binary mixtures and ternary mixtures [3,4], then Dinç and Onur [5] introduced the double divisor of ratio spectra derivative spectrophotometry that was used

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