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Continuous Wavelet Transform, a powerful alternative to Derivative Spectrophotometry in analysis of binary and ternary mixtures: A comparative study



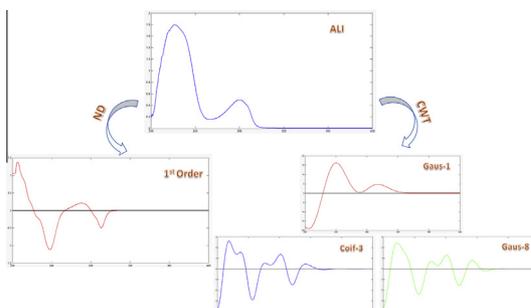
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HIGHLIGHTS

- Numerical Differentiation and Wavelet Transform as approaches for derivative calculation.
- Wavelet Transform is a powerful alternative to traditional derivative algorithms.
- Simple, selective and precise spectrophotometric methods for binary and ternary mixtures.
- The 1st spectrophotometric method for analysis of Amlodipine, Aliskiren and Hydrochlorothiazide.
- Methods validated as per ICH guidelines, parameters found to be within the limits.

GRAPHICAL ABSTRACT



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ABSTRACT

A comparative study was established between two signal processing techniques showing the theoretical algorithm for each method and making a comparison between them to indicate the advantages and limitations. The methods under study are Numerical Differentiation (ND) and Continuous Wavelet Transform (CWT). These methods were studied as spectrophotometric resolution tools for simultaneous analysis of binary and ternary mixtures. To present the comparison, the two methods were applied for the resolution of Bisoprolol (BIS) and Hydrochlorothiazide (HCT) in their binary mixture and for the analysis of Amlodipine (AML), Aliskiren (ALI) and Hydrochlorothiazide (HCT) as an example for ternary mixtures. By comparing the results in laboratory prepared mixtures, it was proven that CWT technique is more efficient and advantageous in analysis of mixtures with severe overlapped spectra than ND. The CWT was applied for quantitative determination of the drugs in their pharmaceutical formulations and validated according to the ICH guidelines where accuracy, precision, repeatability and robustness were found to be within the acceptable limit.

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1. Introduction

UV–VIS absorption spectroscopy is a well-established technique for rapid and accurate determination of analytes in a mixture form without prior separation, if the interferences between the spectra can be eliminated. One of the techniques used for elimination of interference in spectroscopy is signal processing. The most

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