Quantitative analysis of thiamine hydrochloride in tablets–comparison of infrared attenuated total reflection, diffuse reflectance infrared and Raman spectroscopy.

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Rok wydania

2012

Czasopismo

Vibrational Spectroscopy

Numer woluminu

62

Strony

10-16

DOI

10.1016/j.vibspec.2012.07.006

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

The application of FTIR ATR (Fourier transform infrared attenuated total reflection), DRIFT (diffuse reflectance infrared Fourier transform) and FT Raman spectroscopy for the quantification of thiamine hydrochloride, or vitamin B1, in tablets was compared. PLS (partial least squares) calibration models were built and validated using the spectra of 40 samples containing vitamin B1 and excipients. To evaluate the predictive ability of these models, the relative standard errors of prediction (RSEP) were calculated. In the case of vitamin B1 determination from the Raman data, RSEP error values of 1.5 % and 2.1 % were obtained for the calibration and validation data sets, respectively. When DRIFT spectra were applied, the respective RSEP errors were found to be 2.1 % and 2.2 %. For ATR models, these errors amounted to 3.1 % and 3.2 %, respectively. Commercial tablets containing 25 mg of thiamine hydrochloride were quantified using the developed models. Derived concentrations correlated strongly with the results of the reference analysis and yielded recoveries of 99.2–100.8 %. Each of the three applied spectroscopic techniques can be employed as fast and reliable alternatives to the standard pharmacopeial methods of vitamin B1 quantification in tablets. DRIFT spectroscopy has the highest potential to become a routine technique for the quantification of solid mixtures within the pharmaceutical industry.

Słowa kluczowe

ATR spectroscopy, DRIFT spectroscopy, FT Raman spectroscopy, quantitative analysis, Vitamin B1

Adres publiczny

https://doi.org/10.1016/j.vibspec.2012.07.006

Strona internetowa wydawcy

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