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The use of FTIR and Raman spectroscopy in combination with chemometrics for analysis of biomolecules in biomedical fluids: A review

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Abstract

Fourier transform infrared (FTIR) and Raman spectroscopy are complementary techniques, typically called vibrational spectroscopy. Both techniques allow simple, rapid, non-destructive, specific, providing fingerprint spectra, and real-time analytical method for analysis of molecules in different states. Besides, these methods are simple without any excessive sample pre-treatment, therefore, they are sometimes called as "green analytical methods". Biofluids have several biomolecules such as lipid, protein, nucleic acids, and carbohydrates. These biomolecules can be used as biomarkers to detect some types of diseases, since biomolecules are in direct contact with the human organs. FTIR and Raman spectra of biofluids are complex in nature, therefore sophisticated statistical techniques, known as chemometrics, must be used to solve the analytical problems related to quantitative analysis purposes. The objective of this review is to show the capability of FTIR and Raman spectroscopic techniques in combination with chemometrics techniques to analyze the biomolecules in biofluids through an extensive literature review. During performing this review, several databases in Science citation index, Scopus PubMed, and Google Scholar related to the topics are identified and downloaded. With the present review, it is known that FTIR and Raman techniques are rapid method for screening certain diseases by identifying the level changes of some biomolecules. In the future, this method will be widely used for clinicians as new diagnostic tools for many diseases.

Keywords

Author Keywords: FTIR spectroscopy; Raman spectroscopy; chemometrics; biomolecules; biofluids

KeyWords Plus: TRANSFORM INFRARED-SPECTROSCOPY; ATTENUATED TOTAL REFLECTANCE; PROTEIN SECONDARY STRUCTURE; VIBRATIONAL SPECTROSCOPY; BLOOD-SERUM; REAGENT-FREE; GLUCOSE; PLASMA; ATR; CHOLESTEROL

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