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

By: Rohman, A (Rohman, Abdul)[1,2]; Windarsih, A (Windarsih, Anjar)[3]; Lukitaningsih, E (Lukitaningsih, Endang)[1]; Rafi, M (Rafi, Mohamad)[4]; Betania, K (Betania, K.)[5]; Fadzillah, NA (Fadzillah, Nurrulhidayah A.)[5]

BIOMEDICAL SPECTROSCOPY AND IMAGING
Volume: 8 **Issue:** 3-4 **Pages:** 55-71
DOI: 10.3233/BSI-200189
Published: 2019
Document Type: Review

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

Author Information

Reprint Address: Rohman, A (reprint author)

Univ Gadjah Mada, Fac Pharm, Dept Pharmaceut Chem, Yogyakarta 55281, Indonesia.

Addresses:

[1] Univ Gadjah Mada, Fac Pharm, Dept Pharmaceut Chem, Yogyakarta 55281, Indonesia

[2] Univ Gadjah Mada, IHIS, Yogyakarta 55281, Indonesia

[3] Indonesian Inst Sci LIPI, Res Div Nat Prod Technol BPTBA, Yogyakarta 55861, Indonesia

[4] IPB Univ, Fac Math & Nat Sci, Dept Chem, Jalan Tanjung Kampus IPB Dramaga, Bogor 16680, Indonesia

[5] Int Islamic Univ Malaysia, Int Inst Halal Res & Training, Gombak 53000, Selangor, Malaysia

E-mail Addresses: abdulkimfar@gmail.com

Publisher

IOS PRESS, NIEUWE HEMWEG 6B, 1013 BG AMSTERDAM, NETHERLANDS

Categories / Classification

Research Areas: Spectroscopy
Web of Science Categories: Spectroscopy

See more data fields

1 of 1

Cited References: 68

Showing 30 of 68 View All in Cited References page

(from Web of Science Core Collection)

1. Measurement of human serum albumin concentration using Raman spectroscopy setup — Times Cited: 2
By: Artemyev, Dmitry N.; Zakharov, Valery P.; Davydkin, Igor L.; et al.
OPTICAL AND QUANTUM ELECTRONICS Volume: 48 Issue: 6 Article Number: 337 Published: JUN 2016