INTERNATIONAL JOURNAL OF PHARMACEUTICS & DRUG ANALYSIS
VOL.5 ISSUE 9, 2017; 366 – 365; http://ijpda.com; ISSN: 2348-8948

Research Article

Raman vibrational analysis of Hemoglobin with Rutin

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Date Received: 6th August 2017; Date accepted: 25th August 2017; Date Published: 5th September 2017

Abstract

In this study, experimental vibrational frequencies of Hemoglobin, Rutin and the complex of Hemoglobin - Rutin have been investigated. The experimental Raman spectra recorded in 4000-100cm-1 range of the compounds in solid phase have been recorded.

Keywords: FT-Raman, Rutin, Hemoglobin

INTRODUCTION

Phenolic derivatives of flavone are responsible for the brightly coloured pigments of many fruits and vegetables. Polyphenols are found in high concentrations in wine, tea, grapes and in a wide variety of other plants and have been associated with prevention of heart disease and cancer [1]. Due to their polyphenolic nature, flavonoids exhibit strong antioxidant properties and have been widely used as ingredients in pharmaceutical products. They can be subdivided into: flavanols (eg. Quercetin), flavones (eg. apigenin, luteotin), flavanols (eg. catechin) and isoflavones (eg. genestin).

Flavones are also the main components of various natural dyes (eg. weld, fustic, quer citra), mainly yellow but ranging from brown to green and olive-green,used in textile industries since ancient times [2,3].

Materials and methods

FT-Raman spectra have been recorded on BRUKER RFS 27: Stand alone FT-Raman Spectrometer in the range 4000 – 100 cm^{-1} at room temperature. The excitation line at 785nm has been taken from an Nd: YAG laser. Its scan number is 100, the resolution is 2cm^{-1} and the sample is in solid phase.

Results and discussion

FT-Raman spectrum of Hemoglobin has been given in Fig 1. FT-Raman spectra of Rutin and the complex of Hemoglobin - Rutin are given in Figs 2 & 3 respectively. FT-Raman absorption peak intensities of Hemoglobin before and after complex formation have been tabulated in Table 1.

C-C chain vibration has been observed at 1122-999cm^{-1} region. O-O vibrations have been observed at 851±20cm^{-1}. Aliphatic chain vibrations observed at 515-580cm^{-1} region. Lattice vibrations were observed at 76±10cm^{-1}.

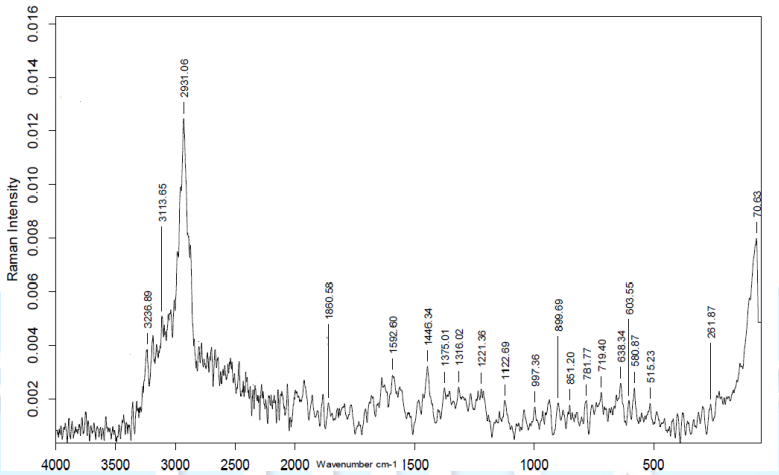

Fig. 1 FT-Raman Spectra of Hemoglobin

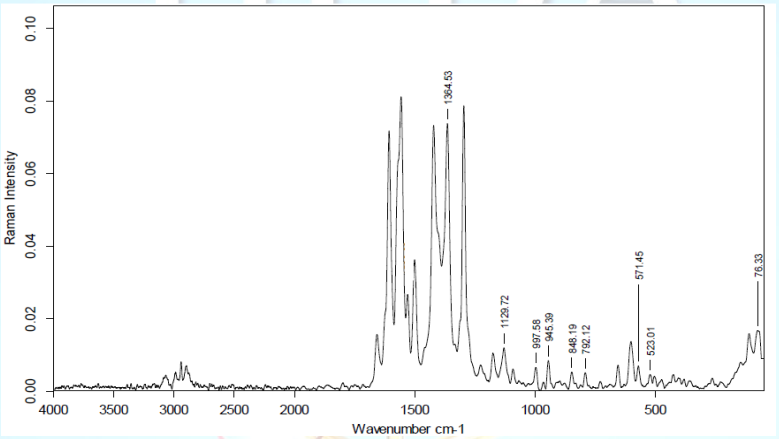

Fig. 2 FT-Raman Spectra of Rutin

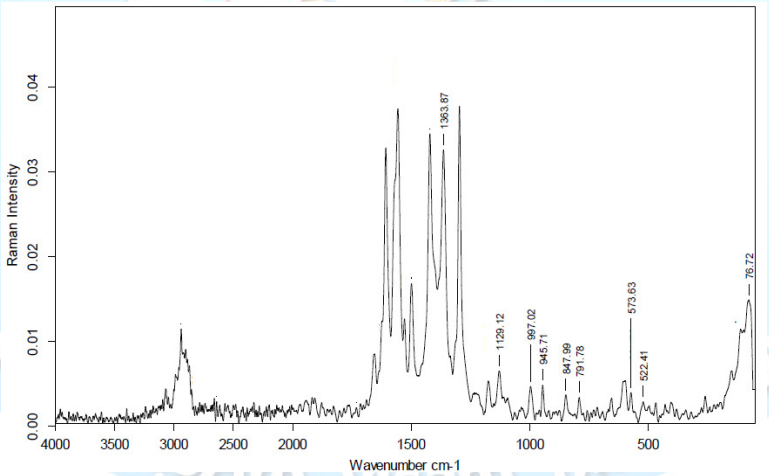

Fig. 3 FT-Raman Spectra of Hemoglobin + Rutin

Table 1 Difference in FT-Raman absorption peak intensities of Hemoglobin before and after complex formation

Intensities (cm^{-1})			Difference in intensities prior to and after %	Tentative assignment
HbA	R	HbA + R		
1375.01	1364.53	1363.87	0.03016	Heme group vibrations, CH_3 vibrations
1122.69	1129.72	1129.12	0.00458	C-C chain vibration
997.36	997.58	997.02	0.00301	C-C chain vibration
936.45	945.39	945.71	0.00291	C-O-C vibrations
851.20	848.19	847.99	0.00194	O-O vibrations
580.87	571.45	573.63	0.00002	aliphatic chain vibrations
515.23	529.01	522.41	0.00109	aliphatic chain vibrations
70.63	76.33	76.72	0.00696	Lattice vibrations

Conclusion

We have presented the interaction of hemoglobin, with Rutin by using one of the important spectroscopic techniques, i.e. FT-Raman Spectroscopy. Vibration analysis has been carried out successfully.

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