IJIRSET

ISSN(Online) : 2319-8753
ISSN (Print) : 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

Vol. 6, Issue 4, April 2017

A FTIR Spectroscopic Study on Quantitation of Glucose in Human Blood Serum

U. Vijaya Ushasree[1], Adeel Ahmad[2]

Research Scholar, Department of Physics, Rayalaseema University, Kurnool, A. P. State, India[1]

Professor of Physics (Retd.), Biophysics Research Laboratory, Department of Physics, Nizam College (Autonomous), Osmania University, Hyderabad, Telangana State, India[2]

ABSTRACT: The measurement of concentration of glucose has been achieved using FTIR Spectroscopy. The FT-IR spectra of human blood serum samples are recorded using liquid cell in Mid IR region 4000-400 cm^{-1}.The normal blood serum is treated with glucose at different concentrations viz2, 4, 6, 8 and 10gm/dLand the FT-IR spectra are recorded, which confirms the specific peak for glucose. A graph between concentration of glucose and intensity of absorption shows a linear relation. There is an increase in the intensity of absorption.

KEY WORDS: FT - IR Spectroscopy, Glucose, Serum.

I. INTRODUCTION

IR spectroscopy has been used by Biophysicist and Chemist as a powerful tool to characterize compounds. It has been applied in biology for studying the structure and conformation of molecules like proteins, nucleic acids and lipids. The advances made in instrumentation have paved the way for its utilization in medicine. Besides the application of FT-IR for tissue diagnostics, the investigation of body fluids has been gaining importance. The mid –IR region is very useful in the identification of disease patterns using the FT-IR spectrum of human blood serum. Precise quantification of several components such as glucose, total protein, and urea can be achieved using FT-IR spectroscopy.

II. RELATED WORK

Lucie Stovickova et al [1] investigated the blood plasma of diabetic patients and healthy controls by Raman optical activity and electronic circular dichroism and measurements were combined with Raman and infrared spectroscopy. The obtained data was evaluated using linear discriminant analysis focusing on the spectral ranges that correspond to the structure and conformation of proteins and other plasmatic biomolecules. They reported that chiroptical spectroscopy gave more detailed information about the 3D structure of biomolecules; and therefore, might be a promising complement to conventional diagnostic methods.

David Scottet al [2]employed infrared spectroscopy as a novel diagnostic tool in the prediction of diabetic status by analyzing the molecular and sub-molecular spectral signatures of saliva collected from subjects with diabetes and healthy controls.Spectral analysis revealed differences in several major metabolic components such as lipid, proteins, glucose, thiocyanate and carboxylate that clearly demarcated healthy and diseased saliva. They established that infrared spectroscopy can be used to generate complex biochemical profiles in saliva and identify several potential diabetes-associated spectral features.

Medhat Ibrahim et al [3] employed molecular modelling using semiempirical methods and density functional theory to calculate the structure and vibrational spectra of D-glucose and D-fructose in their open chain, and α and ß monohydrate forms. The calculated data showed that both molecules were not linear; ground state and the number for

International Journal of Science, Environment and Technology, Vol. 6, No 3, 2017, 1685 – 1689

ISSN 2278-3687 (O)
2277-663X (P)

FTIR SPECTROSCOPIC ANALYSIS ON HUMAN BLOOD GROUPS

U. Vijaya Ushasree[1] and Adeel Ahmad

Biophysics Research Laboratory, Department of Physics, Nizam College (Autonomous)
Osmania University, Hyderabad - 500 001, India
[1]Rayalaseema University, Kurnool - 518 002, India
E-mail: dr_adeelahmad@yahoo.com

Abstract: IR spectroscopic data on human blood of groups A, B, AB and O is presented. IR analysis is made on 90% packed erythrocytes. The characteristic spectral bands pertaining to antigens are discussed. The paper explores the possibility of identification of blood antigens spectroscopically.

Keywords: FTIR spectroscopy; human blood; blood groups.

1. Introduction

FTIR is a powerful tool for identifying types of chemical bonds in a molecule by producing an infrared absorption spectrum that is like molecular *finger print*. This method is used in the different fields of sciences [1, 2, 3]. The FTIR technique reduces time, resources and cuts cost. IR spectroscopy is as a potential diagnostic tool in the medical fields like a pharmacological and pathological. Andreas Barth [4] reviewed and discussed the application of infrared spectroscopy to the study of proteins. He focused on the mid-infrared spectral region in the study of protein reactions by reaction-induced infrared difference spectroscopy. Heinz Fabian and Werner Mantele [5] described IR instrumental techniques for steady state absorbance and reaction – induced difference spectra and reported sampling procedures available to obtain IR spectra of proteins, peptides, amino acids and more complex enzymes.

The present study is an attempt to explore the possibility of characterization of blood groups IR spectroscopically.

2. Materials and Methods

A disposable plastic syringe was used to draw venous blood. Blood samples were collected from healthy volunteers of blood group A, B, AB and O. Blood collection tubes with anticoagulant EDTA (Ethylene Diamine Tetra Acetate) were inverted gently as soon after collection as possible to prevent clotting. The blood samples were brought to the laboratory in silliconized bottles, keeping them in ice cooled thermos. The samples were kept

*Received Apr 11, 2017 * Published June 2, 2017 * www.ijset.net*

International Journal of Innovation Sciences and Research
Vol.6. No, 06, pp. 1025-1027, June 2017

Available online at
http://www.ijisr.com

RESEARCH ARTICLE

A STUDY ON INFRARED SPECTROSCOPY OF HUMAN BLOOD OF PATIENTS SUFFERING FROM DIABETES MELLITUS

[1]Vijaya Ushasree, U. and [2,*]Adeel Ahmad

[1]Rayalaseema University, Kurnool – 518 002, India
[2]Biophysics Research Laboratory, Department of Physics, Nizam College (Autonomous), Osmania University, Hyderabad – 500 001, India

Accepted 22nd May, 2017; Published Online 30th June, 2017

ABSTRACT

The paper reports IR spectroscopic data on blood of patients suffering from *Diabetes mellitus*. IR analysis has been made on whole blood, plasma and serum. The characteristic spectral bands pertaining to glucose in the medium of blood are identified.

Key words: FTIR spectroscopy, Diabetes mellitus, Human blood, Plasma, Blood Serum.

INTRODUCTION

FTIR spectroscopy is being used by chemists as a powerful tool to characterize organic and inorganic compounds. It has been applied in biology for studying the structures and conformation of molecules like proteins, nucleic acids and lipids. The advances made in instrumentation such as development of IR microscopy, definitely, paved the way for the use of FTIR spectroscopy in the discipline of medicine. The role of FTIR spectroscopy in diagnostic aspects involving body fluids, besides tissue diagnostics, is gaining importance. The mid IR region has been proved to be useful in the identification of disease patterns by the use of IR spectra of human blood serum. Precise measurement of glucose, total protein, lipids, cholesterol, urea and pigments like billirubin could be possible with FTIR spectroscopy. Cyril Petibois *et al.*, 1999 developed a new method to determine glucose concentration in dried sera and studied 32 serum samples after fourfold dilution and desiccation before FT-IR analyses on a spectrometer operated at a resolution of 2.0 cm^{-1}. They integrated all spectral windows at the surface of the spectrum in the CO region and measured glucose in the sera by a glucose oxidase method for comparison. Further, they concluded that FT-IR spectroscopy is an accurate method to determine glucose concentration and could be widely used to simultaneously identify and quantify several metabolites in biological fluids or tissues. Syed Ismail Ahmad *et al.*, 2010 made an attempt to estimate concentration of glucose in human urine. They reported specific band at 1034 cm^{-1} for glucose and also a relation between glucose concentration in urine and Transmission (%) of IR band. Shikha Rathore (2014) analyzed, spectroscopic ally in IR region, normal and laser exposed human blood in order to examine the influence of low power red coherent light at molecular and cellular levels. Wanjie Zhang *et al.*, (2013) investigated the effects of two-dimensional correlation spectroscopy (2DCOS) on chance correlations in the spectral data, generated from the correlations between glucose concentration and some undesirable experimental factors, such as instrument drift, sample temperature variations, and interferent compositions in the sample matrix. They evaluated the validity of the spectral data set, instead of assessing the calibration models, and then to provide a complementary procedure for better verifying or rejecting the data set. Further, they demonstrated the utility of the proposed analysis with a series of aqueous solutions using near-infrared spectra over the overtone band of glucoseand results concluded that spectral variations from chance correlations induced by those experimental factors could be determined by the 2DCOS method. The aim of the present study is to evaluate the utility of FTIR spectroscopy for the estimation of glucose in the blood of patients suffering from Diabetes mellitus.

Corresponding author: Adeel Ahmad
Biophysics Research Laboratory, Department of Physics, Nizam College (Autonomous), Osmania University, Hyderabad – 500 001, India.

MATERIALS AND METHODS

The blood samples were collected from patients suffering from Diabetes mellitus. The FT-IR spectrum of blood was recorded. First, spectral grade pure KBr powder was dried in an oven up to 60^0C for 24 hours. Then 1gm powder was taken in an agate motor and was ground until it becomes fine powder. The ground powder was mixed with blood sample and transferred into the bore of a cylinder so that it was distributed across the polished face of lower plate. The polished face of the second plate towards the powder was inserted in to the bore by a plunger. The die assembly was connected to a vacuum pump and was kept under vacuum for approximately 2 min so as to

IJIRSET

ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 6, Issue 11, November 2017

A FTIR Spectroscopic Study on Quantitation of Albumin in Human Blood Serum

U. Vijaya Ushasree[1], G.Pushpa Chakrapani[2], Kaleem Ahmed Jaleeli [3], Adeel Ahmad [4]

Academic Associate, Department of Physics, Dr.B.R.Ambedkar Open University, Telangana. State, India[1]

HOD Department of Physics, Dr.B.R.Ambedkar Open University, Telangana. State, India[2]

Assistant Professor, Department Physics, Nizam College (Autonomous), Osmania University, Hyderabad, Telangana State, India[3]

Professor of Physics (Retd.), Biophysics Research Laboratory, Department of Physics, Nizam College (Autonomous), Osmania University, Hyderabad, Telangana State, India[4]

ABSTRACT: The measurement of concentration of Albumin has been achieved using FTIR Spectroscopy. The FT-IR spectra of human blood serum samples are recorded using liquid cell in Mid IR region 4000-400 cm1.The normal blood serum is treated with Albumin at different concentrations viz 100, 200, 300, 400, and 500 and gm/dL and the FTIR spectra are recorded, which confirms the specific peak for Albumin. A graph between concentration of Albumin and intensity of absorption shows a linear relation. There is an increase in the intensity of absorption.

KEY WORDS: FT - IR Spectroscopy, Albumin, Serum.

I. INTRODUCTION

IR spectroscopy has been used by Biophysicist and Chemist as a powerful tool to characterize compounds. It has been applied in biology for studying the structure and conformation of molecules like proteins, nucleic acids and lipids. The advances made in instrumentation have paved the way for its utilization in medicine. Besides the application of FT-IR for tissue diagnostics, the investigation of body fluids has been gaining importance. The mid –IR region is very useful in the identification of disease patterns using the FT-IR spectrum of human blood serum. Precise quantification of several components such as Albumin, total protein, and urea can be achieved using FT-IR spectroscopy

II. RELATED WORK

Zhdanov et al [9] made a comparative study to determine the role of the skeletal base configuration of carbohydrate molecules, using IR and Raman spectroscopy. Theoretical calculations of the vibrational spectra of series of carbohydrates differed in the configuration of CO (CH) bonds in various positions of the pyranosering. The normal vibrations of carbohydrate molecules had, with few exceptions, close or coinciding frequencies; however, they differed greatly in the shape and contribution to the potential energy distribution(PED) of individual groups and bonds. Despite the cooperative character of the vibrations, each compound was characterized by a specific set of frequencies with a prevailing contribution to the PED of particular CO and CC bondsof the molecule. They concluded that vibrations have a peculiar localization and that steric factors play an important role in the vibrational spectra of carbohydrates.

Minesh Patel et al [10] Studied poly acrylic acid and mucus using infrared, 1H and 13C nuclear magnetic resonance, and X-ray photoelectron spectroscopes and differential scanning calorimetry, which supported the hypothesis that hydrogen bonds, formed between the carboxylic acid functionality of the muco- adhesive material poly(acrylic acid) and the glycoprotein component of mucus, play a significant role in the process of muco-adhesion. They found fewer

INTERNATIONAL JOURNAL OF RESEARCH CULTURE SOCIETY ISSN: 2456-6683 Special Issue - 8, Feb - 2018
UGC Approved Monthly, Peer-Reviewed, Refereed, Indexed Journal Impact Factor: 3.449 Publication Date: 25/02/2018

Second National Conference on
RECENT ADVANCES IN APPLIED NANO MATERIALS
February 16-17, 2018 at Department of Physics, University College of Science, Saifabad, Osmania University, Hyderabad, Telangana State, India.

FTIR Spectroscopic Study on Quantitation of Urea in Human BloodSerum

U. Vijaya Ushasree[1] & Adeel Ahmad
Biophysics Research Laboratory, Department of Physics, Nizam College (Autonomous), Osmania University, Hyderabad – 500 001, India.
[1]Department of Physics,Dr.B.R.Ambedkar Open University, Hyderabad - 500033, India.
dr_adeelahmad@yahoo.com

Abstract: *The quantitation of urea has been achieved using FTIR spectroscopy. The FTIR spectra of human blood serum samples are recorded in Mid IR region 4000-400 cm^{-1}.The normal blood serum is treated with urea at different concentrations and FTIR spectra are recorded, which confirm the specific peaks related to urea. A plot between concentration of urea and percentage of absorbancehas shown linear relationship. The study being complementary to chemical analysis is very much useful for the estimation of urea in the blood serum of patients suffering from diabetes and renal diseases.*

Key Words: *FTIR Spectroscopy, Quantitation, Human blood, Serum, Urea.*

1. INTRODUCTION:

IR spectroscopy has been used by Biophysicist and Chemist as a powerful tool to characterize compounds. It has been applied to biology for studying the structure and conformation of molecules like proteins, nucleic acids and lipids. The advances made in instrumentation have paved the way for its utilization in medicine. Besides the application of FTIR for tissue diagnostics, the investigation of body fluids has been gaining importance. The mid –IR region is very use full in the identification of disease patterns using the FT-IR spectrum of human blood serum. Precise quantification of several components such as albumin, total protein, and Urea can be achieved using FT-IR spectroscopy

Zhdanov et al [1] made a comparative study to determine the role of the skeletal base configuration of carbohydrate molecules, using IR and Raman spectroscopy. Theoretical calculations of the vibrational spectra of series of carbohydrates differed in the configuration of CO (CH) bonds in various positions of the pyranosering. The normal vibrations of carbohydrate molecules had, with few exceptions, close or coinciding frequencies; however, they differed greatly in the shape and contribution to the potential energy distribution(PED) of individual groups and bonds. Despite the cooperative character of the vibrations, each compound was characterized by a specific set of frequencies with a prevailing contribution to the PED of particular CO and C - C bondsof the molecule. They concluded that vibrations have a peculiar localization and that steric factors play an important role in the vibrational spectra of carbohydrates.

Minesh Patel et al [2] Studied poly acrylic acid and mucus using infrared, 1H and 13C nuclear magnetic resonance, and X-ray photoelectron spectroscopes and differential scanning calorimetry, which supported the hypothesis that hydrogen bonds, formed between the carboxylic acid functionality of the muco - adhesive material (polyacrylic acid) and the glycoprotein component of mucus, play a significant role in the process of muco-adhesion. They found fewer H-bonded interactions between the components than within the bulk of the pure muco-adhesive agent andpH of the medium influenced the structures of both the poly acrylic acid and the mucus, which, in turn, determine the nature and the extent of muco-adhesive interactions.

Davis and Mauer [3] highlighted the principles of FTIR spectroscopic analysis of bacteria; the advantages and disadvantages of FT- IR applied to bacterial analysis; various sampling techniques; spectral manipulation; statistical analysis of spectra; and applications in pathogen detection.

Jana kopikova et al [4] used FT-IR spectroscopy for the estimation of isolated high molecule fractions and also for the identification of food hydrocolloids in confectionery jellies and food supplements. The simple comparison of spectra of standards and samples proved that this technique is useful for the monitoring of food hydrocolloids in particular food products

INTERNATIONAL JOURNAL OF RESEARCH CULTURE SOCIETY ISSN: 2456-6683 Volume - 2 Issue - 3, Mar - 2018
UGC Approved Monthly, Peer-Reviewed, Refereed, Indexed Journal Impact Factor: 3.449 Publication Date: 31/03/2018

Infrared Spectroscopic Study on Human Blood of Patients Suffering from Renal Failure

U. VIJAYA USHASREE[1], G. PUSHPA CHAKRAPANI[2], ADEEL AHMAD[3]
[1,2] Department of Physics, Dr. BRAOU, Hydarabad – 500 033, India,
[3]Biophysics Research Laboratory, Department of Physics, Nizam College (Autonomous),
Osmania University, Hyderabad – 500 001, India

Abstract: *The paper reports IR spectroscopic data on blood of patients suffering from chronic renal failure. IR analysis has been made on whole blood, plasma and serum. The characteristic spectral bands pertaining to Albumin, Creatinine and Urea present in the blood are identified. The paper explores the possibility of disease analysis by IR spectroscopy.*

Keywords: *FTIR spectroscopy; Human blood; Plasma; Blood Serum; Chronic Renal failure.*

1. INTRODUCTION:

FTIR spectroscopy is being used by chemists as a powerful tool to characterize organic and inorganic compounds. IR spectroscopy was used to determine glucose concentration in dried serum [1]. IR spectroscopy is emerging as a potential diagnostic tool in the medical and pharmacological fields to provide information about the different chemical structures of healthy and pathological tissues [2]. In recent past, mid infrared and UV - Visible spectroscopy was efficiently employed in the fields of biological sciences [3]. The role of FTIR spectroscopy in diagnostic aspects involving body fluids, besides tissue diagnostic is gaining importance.

2. MATERIALS AND METHODS:

The blood samples were collected from patients suffering from Renal failure. The FTIR spectrum of blood was recorded. First, spectral grade pure KBr powder was dried in an oven up to 60 ^{0}C for 24 hours. Then 1 gm powder was taken in an agate motor and was ground until it becomes fine powder. The powder was mixed with blood sample and transferred into the bore of a cylinder so that it was distributed across the polished face of the lower plate. The polished face of the second plate towards the powder was inserted into the bore by a plunger. The die assembly was connected to a vacuum pump and was kept under vacuum for approximately 2 min so as to remove air from the sample disc. The die was dismantled and the KBr disc was removed without touching its faces.

Here, FTIR spectrometer of make Shimadzu FTIR-8400s was used. The resolution was kept at 4 cm^{-1} and scanning time was fixed at 38 sec. A total number of 32 scans were carried out on each sample. The scanning range fixed from 4000 cm^{-1} – 400 cm^{-1} for each sample.

3. RESULTS AND DISCUSSION:

Fig 1 shows IR spectrum of the blood drawn from the patients suffering from renal failure. The spectral data is presented in Table 1.

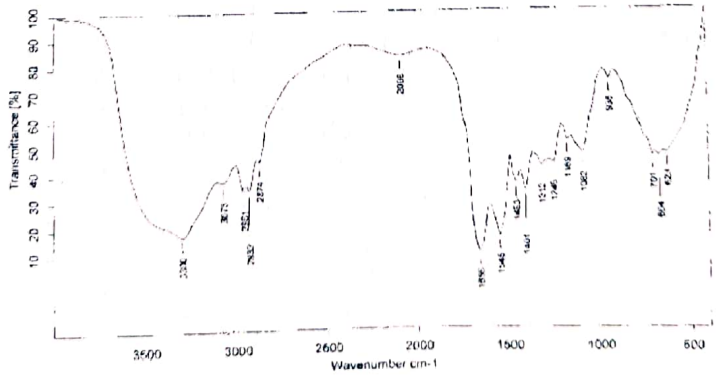

Fig. 1. A typical FTIR Spectrum of blood of Renal Failure patient

Table 1 present FTIR data on blood of patients suffering from renal failure. The data comprises wave numbers and corresponding transmittance (%) of bands concerned with characteristic vibration of functional groups of diseased blood sample.

Table 1- FTIR data on Blood of patients suffering from Renal failure

INTERNATIONAL JOURNAL OF RESEARCH CULTURE SOCIETY
Monthly, Peer-Reviewed, Refereed, Indexed Journal
ISSN: 2456-6683 Volume - 2, Issue - 9, Sept – 2018
Impact Factor: 4.526 Publication Date: 30/09/2018

FTIR Spectroscopic Study on Quantitation of Billirubin in Human BloodSerum

[1]Dr.U. VIJAYA USHASREE, [2]Prof.G.PUSHPA CHAKRAPANI, [3]Prof.ADEEL AHMAD
[1]Department of Physics,Dr.B.R.Ambedkar Open University, Hyderabad - 500033, India.
[2]Department of Physics,Dr.B.R.Ambedkar Open University, Hyderabad - 500033, India.
[3]Biophysics Research Laboratory, Department of Physics, Nizam College (Autonomous), Osmania University, Hyderabad – 500 001, India
Email: dr_adeelahmad@yahoo.com, ulchala99@gmail.com, pushpanig@gmail.com

Abstract: *The Quantitation of Billirubin has been achieved using FTIR spectroscopy. The FTIR spectra of human blood serum samples are recorded in Mid IR region 4000-400cm^{1}.The normal blood serum is treated with Billirubin at different concentrations and FTIR spectra are recorded, which confirm the specific peaks related to Billirubin. A plot between concentration of Billirubin and percentage of absorbance has shown linear relationship. The study being complementary to chemical analysis is very much useful for the estimation of Billirubin in the blood serum of patients suffering from diabetes and renal diseases.*

Key Words: *FTIR Spectroscopy, Quantitation, Human blood, Serum, Billirubin.*

1. INTRODUCTION:

IR spectroscopy has been used by Biophysicist and Chemist as a powerful tool to characterize compounds. It has been applied to biology for studying the structure and conformation of molecules like proteins, nucleic acids and lipids. The advances made in instrumentation have paved the way for its utilization in medicine. Besides the application of FTIR for tissue diagnostics, the investigation of body fluids has been gaining importance. The mid–IR region is very useful in the identification of disease patterns using the FT-IR spectrum of human blood serum. Precise quantification of several components such as albumin, total protein, Urea and Billirubin can be achieved using FT-IR spectroscopy.

Zhdanov et al [1] made a comparative study to determine the role of the skeletal base configuration of carbohydrate molecules, using IR and Raman spectroscopy. Theoretical calculations of the vibrational spectra of series of carbohydrates differed in the configuration of CO (CH) bonds in various positions of the pyranosering. The normal vibrations of carbohydrate molecules had, with few exceptions, close or coinciding frequencies; however, they differed greatly in the shape and contribution to the potential energy distribution(PED) of individual groups and bonds. Despite the cooperative character of the vibrations, each compound wascharacterized by a specific set of frequencies with a prevailing contribution to the PED of particular CO and C - C bonds of the molecule. They concluded that vibrations have a peculiar localization and that steric factors play an important role in the vibrational spectra of carbohydrates.

Minesh Patel et al [2] Studied poly acrylic acid and mucus using infrared, 1H and 13C nuclear magnetic resonance. and X-ray photoelectron spectroscopes and differential scanning Calorimetry, which supported the hypothesis that hydrogen bonds, formed between the carboxylic acid functionality of the muco - adhesive material (polyacrylic acid) and the glycoprotein component of mucus, play a significant role in the process of muco-adhesion. Theyfound fewer H-bonded interactions between the components than within the bulk of the pure muco-adhesive agent and pH of the medium influenced the structures of both the poly acrylic acid and the mucus, which in turn determine the nature and the extent of muco-adhesive interactions.

Davis and Mauer [3] highlighted the principles of FTIR spectroscopic analysis of bacteria; the advantagesand disadvantages of FT- IR applied to bacterial analysis; various sampling techniques; spectral manipulation statistical analysis of spectra; and applications in pathogen detection.

Jana kopikova et al [4] used FT-IR spectroscopy for the estimation of isolated high molecule fractions andalso for the identification of food hydrocolloids in confectionery jellies and food supplements. The simple comparisonof spectra of standards and samples proved that this technique is useful for the monitoring of food hydrocolloids inparticular food products.

SyedIsmailAhmadetal[5] estimated concentrationof glucose in human urine.They reported specific bandat1034 cm^{-1}for glucose and established are lation between glucose concentration in urine and Transmission(%) of IR band.

IJRAR.ORG E-ISSN: 2348-1269, P-ISSN: 2349-5138

INTERNATIONAL JOURNAL OF RESEARCH AND ANALYTICAL REVIEWS (IJRAR) | IJRAR.ORG

An International Open Access, Peer-reviewed, Refereed Journal

A STUDY ON FTIR SPECTROSCOPY OF QUANTITATION OF CREATININE IN HUMAN BLOOD SERUM

[1]Dr.U. VIJAYA USHASREE, [2]Prof. G. PUSHPA CHAKRAPANI, [3]Prof.ADEEL AHMAD

[1]Assistant Professor, [2]Professor, [3]Rtd. Professor

[1]Department of Physics, Dr.B.R.Ambedkar Open University, Hyderabad - 500033, India.

[2]Department of Physics, Dr.B.R.Ambedkar Open University, Hyderabad - 500033, India.

[3]Biophysics Research Laboratory, Department of Physics, Nizam College (Autonomous), Osmania University, Hyderabad – 500 001, India

Abstract: The measurement of concentration of Creatinine has been achieved using FTIR Spectroscopy. The FTIR spectra of human blood serum samples are recorded using liquid cell in Mid IR region 4000-400 cm^{-1}. The normal blood serum is treated with Creatinine at different concentrations of Creatinine 100,200,300,400 and 500 gm/dL and FTIR spectra are recorded, which conforms the specific peak for Creatinine. A graph between concentration of Creatinine and intensity of absorption shows a linear relation. There is an increase in the intensity of absorption.

Key Words - FTIR Spectroscopy, Quantitation, Human blood, Serum, Creatinine

I INTRODUCTION

IR spectroscopy has been used by Biophysicist and Chemist as a powerful tool to characterize compounds. It has been applied to biology for studying the structure and conformation of molecules like proteins, nucleic acids and lipids. The advances made in instrumentation have paved the way for its utilization in medicine. Besides the application of FTIR for tissue diagnostics, the investigation of body fluids has been gaining importance. The mid–IR region is very useful in the identification of disease patterns using the FT-IR spectrum of human blood serum. Precise quantification of several components such as albumin, total protein, Urea and Billirubin ,creatinine can be achieved using FT-IR spectroscopy.

Minesh Patel et al [1] Studied poly acrylic acid and mucus using infrared, 1H and 13C nuclear magnetic resonance, and X-ray photoelectron spectroscopes and differential scanning Calorimetry, which supported the hypothesis that hydrogen bonds, formed between the carboxylic acid functionality of the muco - adhesive material (polyacrylic acid) and the glycoprotein component of mucus, play a significant role in the process of muco-adhesion. They found fewer H-bonded interactions between the components than within the bulk of the pure muco-adhesive agent and pH of the medium influenced the structures of

IJRAR.ORG E-ISSN: 2348-1269, P-ISSN: 2349-5138
INTERNATIONAL JOURNAL OF RESEARCH AND ANALYTICAL REVIEWS (IJRAR) | IJRAR.ORG
An International Open Access, Peer-reviewed, Refereed Journal

A STUDY ON ELASTIC AND ACOUSTIC PARAMETERS OF BLOOD AND ITS CONSTITUENTS IN CANCER PATIENTS

Dr. G. Pushpa Chakrapani[1] Dr. U. Vijaya Ushasree[2]

Professor in department of Physics[1] ·Assistant professor in department of Physics[2]
[1]Department of Physics, Dr. B. R. Ambedkar Open University, Hyderabad - 500033, India
[2]Department of Physics, Dr. B. R. Ambedkar Open University, Hyderabad - 500033, India.

Abstract : The objective of the present study is to review the elastic and acoustic parameters of blood and its constituents in cancer patients. Blood contains many chemical compounds to perform various functions. For describing the dynamics of blood flow, the viscoelastic parameters such as viscosity and elasticity should be obtained from the measurements under oscillatory shear flow.

Viscoelastic materials have interesting properties. They exhibit both viscous behaviour as well as elasticity. Because of this complex behaviour, the use of linear material properties is generally inadequate in accurately determining the final shape of viscoelastic materials, the time taken to arrive at that geometry, and the stress on the part. In these cases , the material's viscoelasticity must be taken into account in the simulation.

The paper presents the data on elastic and acoustic parameters of human blood its Plasma and 90% of erythrocytes of Cancer patients by using the Ultrasonic interferometer. By knowing the density of blood elastic constant, acoustic parameters like coefficient of absorption, modulus of elasticity and loss modulus are determined for different frequencies.

Key words: Elastic constant, absorption coefficient, modulus of elasticity and loss modulus

1. Introduction

Blood is a vital fluid found in human beings and other animals. Blood viscosity is a basic biological parameter that affects blood flow both at large arteries and in microcirculation. About 55% of the blood is composed of a liquid known as Plasma. The rest of the blood is made up of three major types of cells, as discussed above i.e. Red Blood Cells, known as Erythrocytes, white blood cells, known as Leukocytes and Platelets (thrombocytes).

Viscoelasticity is a rheological parameter that describes the flow properties of complex fluids like blood. There are two components to the viscoelasticity, the viscosity and the elasticity. From hemorheological point of view blood is considered as (1)Newtonian fluid, (2)Non-Newtonian fluid,(3) Micro polar fluid and (4) viscoelastic fluid based on the molecular composition, cellular constituents, and diameter of tube(blood vessel) in which it is flowing.