



Neuberg
DIAGNOSTICS

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New INSIGHTS



Stone Analysis

Serial number : 011 Edition : 1. 2022

Introduction

- ▶ Nephrolithiasis is a common disease, occurring in both industrialized and developing countries and mainly affecting adults aged 20–60 years
- ▶ Stone formation is the end result of a multistep process in which the balance of factors that promote crystallization of urinary salts and factors that inhibit crystallization is perturbed.
- ▶ Urinary stones may be composed of calcium oxalate monohydrate (COM, whewellite), calcium oxalate dihydrate (COD, weddellite), carbonate apatite (CA, dahllite), ammonium urate, magnesium ammonium phosphate (PAM, Struvite), calcium hydrogen phosphate dihydrate (brushite), uric acid (AUO anhydrous form and AU2 dihydrate form, uricite) and its salts, cystine, xanthine, 2,8-dihydroxyadenine, and drugs.

Why to analyse stone?

To assist with identification of risk factors.

01

02

Stone analysis complements, but does not replace, blood and urine analysis in overall metabolic assessment of the stone former.

It may be viewed as a 'biochemical biopsy' so allows identification of risk factors.

03

04

The finding of a stone constituent such as cystine points to a specific diagnosis.

The multifactorial nature often associated with the pathogenesis of these types of stones requires further investigation to give specific information on which to base treatment.

Why FTIR (Fourier Transform Infrared Spectroscopy) method for stone analysis?

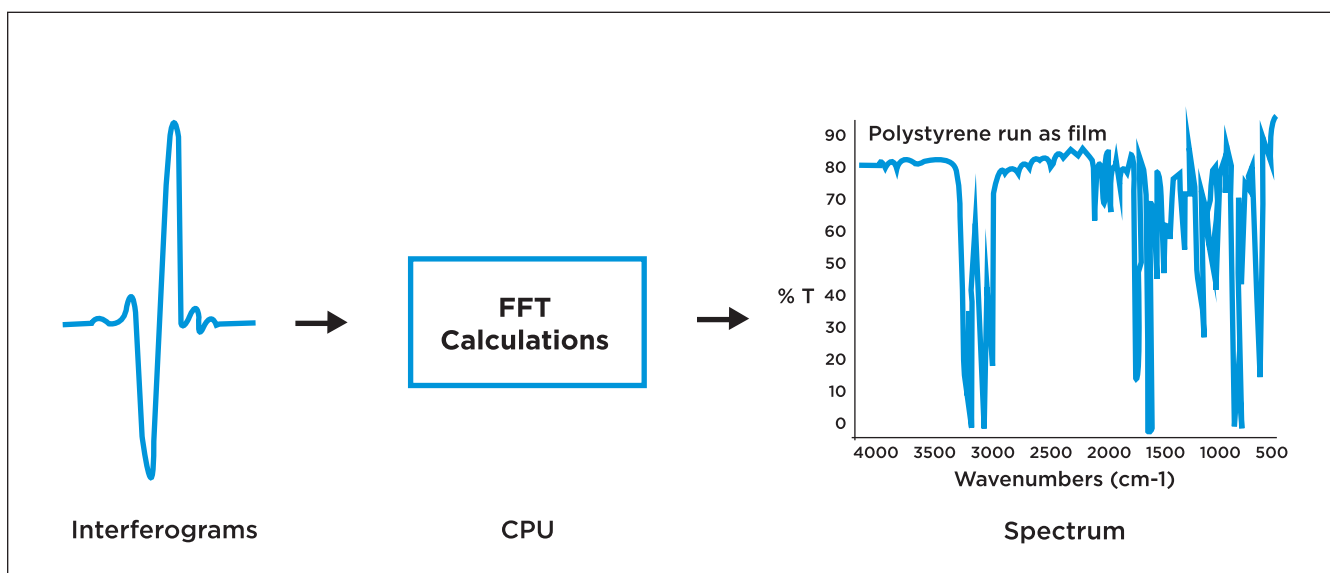
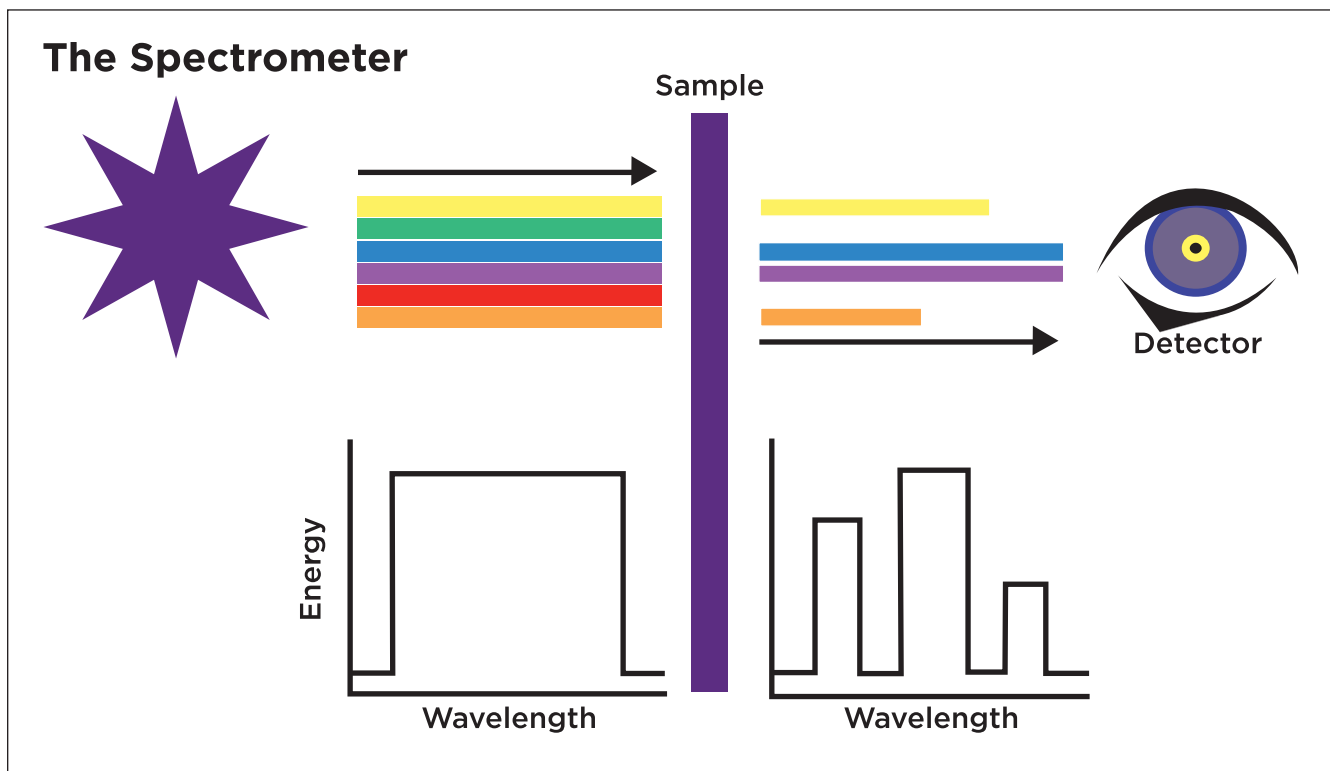
Chemical spot tests are relatively inaccurate because of false-positive and false-negative results and do not allow distinguishing between the crystalline phases. Among physical methods, X-ray diffraction is appropriate for quantification of mineral samples, but it cannot adequately detect amorphous species such as carapatite or struvite. FT-IR spectroscopy is the most appropriate technique for stones analysis and is becoming the gold standard for stone analysis .

Technique	Advantages	disadvantages
Fourier transform infrared spectroscopy	<ul style="list-style-type: none"> ▶ High sensitivity - can examine small amount of sample ▶ Fast result ▶ Cost effective ▶ Does not need highly qualified technician ▶ Semiautomatic evaluation and able to identify organic components or noncrystalline substances ▶ Can also recognize even small fractions of multiple components as percentage more precisely and accurately as compared to other techniques 	<ul style="list-style-type: none"> ▶ Lengthy and time-consuming preparation ▶ Because of overlapping absorption bands, sometimes there is difficulty in detection of small amounts of components in some complex stone
Chemical analysis	<ul style="list-style-type: none"> ▶ Cost- effective ▶ Simple to perform 	<ul style="list-style-type: none"> ▶ Needs large sample size ▶ Time taking ▶ Gives information about individual ions and radicals rather than a specific compound ▶ Cannot detect amorphous or noncrystalline components ▶ Costly
X-ray diffraction	<ul style="list-style-type: none"> ▶ Analysis is quantitative ▶ Can be applied on small sample size ▶ Measurement is automatic ▶ Easy ▶ Exact differentiation of all crystalline components is possible 	<ul style="list-style-type: none"> ▶ Cannot detect amorphous or noncrystalline components ▶ Costly
Scanning electron microscopy	<ul style="list-style-type: none"> ▶ Possibility to visualize the components, their shape, internal structure, location inside the stone, and relation between the crystals and the organic matrix 	<ul style="list-style-type: none"> ▶ Costly ▶ Needs qualified technicians
Thermogravimetry	<ul style="list-style-type: none"> ▶ Simple ▶ Fast 	<ul style="list-style-type: none"> ▶ Closely related compounds are difficult to differentiate ▶ Needs large amount of sample

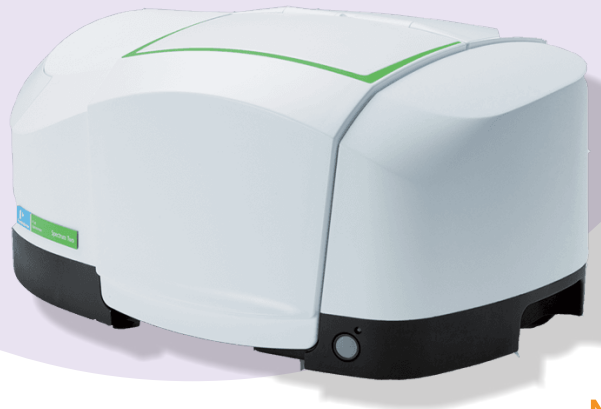
How FTIR works?

In infrared spectroscopy, IR radiation is passed through a sample. Some of the infrared radiation is absorbed by the sample and some of it is passed through (transmitted). The resulting spectrum represents the molecular absorption and transmission, creating a molecular fingerprint of the sample. So, what information can FT-IR provide?

- ▶ It can identify unknown materials
- ▶ It can determine the quality or consistency of a sample
- ▶ It can determine the amount of components in a mixture.



Spectrum II FTIR from Perkin Elmer



Report format

Neberg Supratex
REFERENCE LABORATORIES

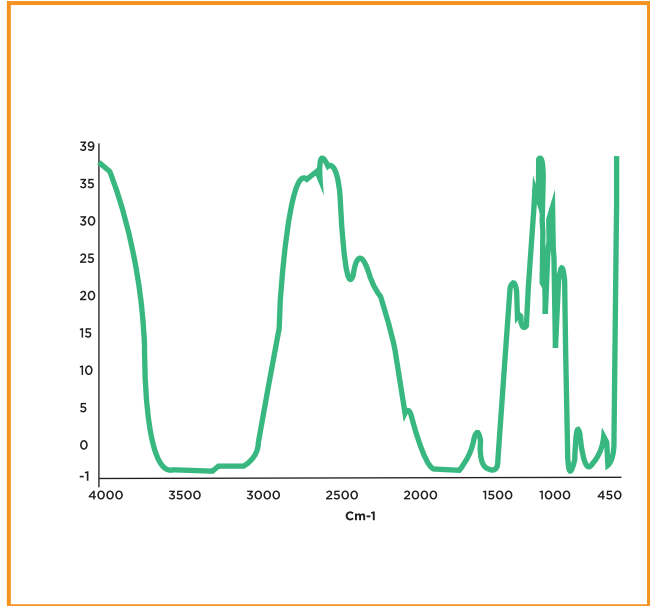
LABORATORY REPORT

Name: **Singha, Mile / 68 Years** Case ID: **2020122202**
 Ref. By: **Di. At** P. ID:
 Bill. Loc.: PL Loc.:
 Reg. Date and Time: **14-Mar-2022 10:00** Sample Type: **Stone** Module No.:
 Sample Date and Time: **14-Mar-2022 10:00** Sample Coll. By: **user@STMR** Ref #1: **LR202140518**
 Report Date and Time: **16-Mar-2022 17:43** Acc. Remarks: Ref #2:

TEST	RESULTS	UNIT	BIOLOGICAL REF RANGE	REMARKS
HAEMATOLOGY INVESTIGATIONS				
STONE ANALYSIS BY FTIR ON SPECTRUM 2				
Physical Examination	Not specified			
Source				
Size	16mm x 8mm - in total			
Surface	Rough			
Texture	Hard			
Colour Stone	Yellowish			
Chemical Composition Of Nitrus				
1st Constituent	Calcium oxalate monohydrate (50%)			
2nd Constituent	Carbonate Apatite(10%)			

End Of Report

Machine Data



Single Search Details 2

Search Score

Search Reference

0.980351

Ks0357

0.970009

Ks0356

0.957891

Ks0336

0.94699

Ks0329

0.945827

Ks0353

0.945193

Ks0359

0.936806

Ks0339

0.936077

Ks0358

0.931084

Ks0331

0.929126

Ks0328

Single Search Details 2

Search Reference Spectrum Description

0357.SP WHEWELLITE AND WEDDELLITE

0356.SP WHEWELLITE AND WEDDELLITE

0336.SP WHEWELLITE + WEDDELLITE 1:1

0329.SP WHEWELLITE

0353.SP WHEWELLITE AND WEDDELLITE

0359.SP WHEWELLITE SYNTHETIC

0339.SP WHEWELLITE 80 % + AMMONIUM URATE 10% + CARBONATE APATITE 20%

0358.SP WHEWELLITE SYNTHETIC

0331.SP WHEWELLITE

0328.SP WHEWELLITE

Single Search Details 2

Search Library

Search Library Path

Search Library Description



Sample type:
Kidney/Gall Bladder
stone



Machine :
PerkinElmer's
Spectrum II



Method:
FTIR (Fourier
Transformed Infrared
spectroscopy)



TAT:

Tuesday

Thursday

Saturday

with cut off time 12 noon, reporting same day
evening by 8 pm.

PARTNERS IN HEALTH



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