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Fourier transform infra-red spectroscopic study in homoeopathic potentized medicines

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Abstract
During Drug-dynamization the produced mechanical energy (~ 404.3 Nm/10 strokes) is presumably transformed to the H-bonded network system of ethanol (medium) that shows the signature in IR/Raman spectral analysis. In the present work, Fourier Transform Infra-Red (FTIR) Spectroscopic studies on different homoeopathic medicines of different kingdom with various potencies have been performed and the results have been compared with that of 91% (v/v) ethanol (the medium). The broad spectrum for all cases (including ethanol) can be decomposed into three Gaussian components centered around 3275cm^{-1}, 3395cm^{-1}, and 3502cm^{-1}. In pure ethanol these frequencies are the signature of the –OH groups of ethanol with strong, weak and dissociated H-bonding. Spectra for different sample medicines have the three bands but the relative percentage of population of different H-bonding for each medicine is dependent on the nature of the drug and its potency indicating that each medicine possesses an individual character in energy patterns in terms of H-bonding pattern and not in the molecular and nano particle nature.

Keywords: Homoeopathy, ethanol, FTIR spectroscopy, hydrogen bonding, potentization, homoeopathic medicine

Introduction
Homoeopathy is discovered by our Master Christian Fredrick Sammuel Hahnemann before 200 years [1]. It is the important therapeutic method of treatment to cure the patients due to its low costs, minimum side effects, easy availability and strong curative power. It has been well proved that a minute amount of homoeopathic medicine while administered into the patients can cure the innumerable number of diseases from the body system. It is practically proved that beyond 12th potency (12C), no drug molecules do exist in the ethanol solution [2, 3]. Starting martial is completely absent. But, it is a matter of question that how a homoeo medicine acts in the living body in spite of the absence of any drug molecules in the homoeo medicines.
So, we have to face on the criticism of the chemists, physicists, pharmacists etc. Again, a few imponderable medicines like as X-Ray, Electricity, and Electricitas and Magnetis Poli Ambo, Magnetis polus Australis etc. are prepared from absorption of their radiation into the lactose sugar and on dynamization different potencies are produced. Here also there exist no drug molecules. So, the question is, how the energy medicines do cure the diseases in the living bodies [4].
During preparation of homoeopathic potentized medicines (Drug-dynamization) there needs 10 equal strokes that create ~ 404.3 Nm mechanical energy that is transferred to the medium (ethanol).Due to 10 equal strokes, molecular collisions among the drug/drug, ethanol/ethanol, ethanol/drug molecules a certain amount of energy will be produced that is transferred to the H-Bonded network system of ethanol that shows the signature in IR/Raman spectral analysis Although limited Raman study with two drugs have been performed [5] no general conclusion is obtainable.
In the present work, the Fourier Transform Infra-Red (FTIR) spectrum analysis of various drugs of different kingdom at different potencies (30C, 200C, 1M) and different drugs of the same potencies have been studied and compared with that of ethanol (medium). Different parameters such as peak positions, band intensities, area measurements, relative areas, percentage of populations of differently H-bonded –OH groups in the medium have been calculated for the various drugs using the spectral data.

Material and Methods
Fourier Transform Infra-Red (FTIR) studies of different homoeopathic drugs of different potencies were performed. Samples of different homoeopathic medicines of different

potencies and of different kingdom are collected. These include:

- NUX Vomica (Poison Nut: Plant kingdom): 30C, 200C, 1M;
- Chelidonium Majus (Plant Kingdom): 30C, 200C, 1M;
- Carcinosin (a nosode of carcinoma): 30C, 200C, 1M;
- X-Ray (drug of imponderable kingdom or energy medicine): 30C, 200C, 1M;
- Calcarea Arsenica (Calcium Arsenate, a salt of mineral kingdom): 30C, 200C;
- Chininum Arsenicosum (Arsenate of Quinine): 30C, 200C;
- Uranium Nitricum (Nitrate of Uranium, a salt of a radioactive metal): 30C, 200C;
- Magnetis Polus Australis (south pole of the magnet, a drug of imponderable kingdom, energy medicine): 200C;

A sample of ethanol (91% v/v), a vehicle of the drug is also subjected to FTIR analysis.

Ethanol (91% v/) and different potencies of drugs of freshly potentized and of different kingdom are supplied by Organon Homoeo Laboratory Pvt. Ltd., 162, Bipin Behari Ganguli street, Kolkata-700012

Contact: Mail ID: organon1999@gmail.com

Methods: Linear IR Spectroscopy: IR absorption spectra were measured on a BRUKER vector 70 FTIR spectrometer with 2 cm^{-1} resolution at room temperature. For each sample, ~ 100 µL of the sample solution is loaded into a mount ash cell (PIKE Technologies) consisting of tar windows (CaF_2, 3 mm thickness, Shenzhen Laser) separated by Mylar spacer of 100 µm thickness. Each IR Spectrum was fitted to three Vogt line shapes to obtain the peak positions, the intensities and peak areas.

Results and Discussions: FTIR studies of different homoeo drugs of different potencies have been performed.IR spectrum of ethanol (91%v/v) has been shown in Figure 1. Reprehensive spectrums of different drugs of various potencies and of various kingdoms are also given in Figures 2 - 6.

In all the cases, the observed spectrum is far from a Gaussian shape. In most of the cases, a broad band with a maximum around 3400cm^{-1} has been observed. The spectrum is fitted with three components. The three components (i, ii and iii) along with the fitted curves has also been shown in figures 1 to 6.

The component spectra shows peak at 3275cm^{-1}, 3395cm^{-1} and 3502cm^{-1}. These correspond to –O-H stretching frequencies in ethanol and have been explained as due to strong, weak and broken hydrogen bond respectively [5 - 8].

The maximum intensity of the maximum absorption of a component spectrum indicates the relative population of different H-bonded spaces in solution.

However, the total area under the curve is a better measure of the parameter in solution. The integrated area has also been calculated for each spectrum. Values of Intensity area for the three spectral components for ethanol and various drugs have been given in table 1.

In ethanol, the –OH groups form an H-bonded network. Some of the bonds are strong and some are weak. Some of the ethanol molecules are not involved in the H-bond formation. The –OH groups shows its signature in the IR Spectrum. For a strongly H-bonded –OH group, the maximum absorption appears at a lower frequency (due to reduce –OH bond strength) than that for a free –OH (not involved in the H-bond formation).

The observed peak at 3275 cm^{-1} can be assigned to the strongly H-bonded –OH groups in solution, while the peak at 3500 cm^{-1} can be characterized due to free –OH groups. The peak at3400cm^{-1}indicates the weak bonded species (-OH groups) in the solution.

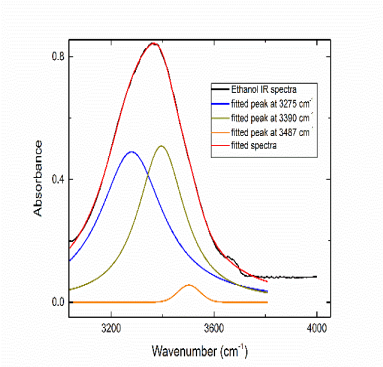
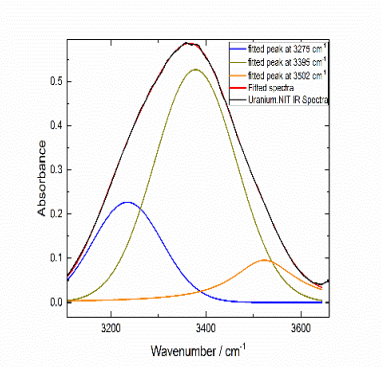
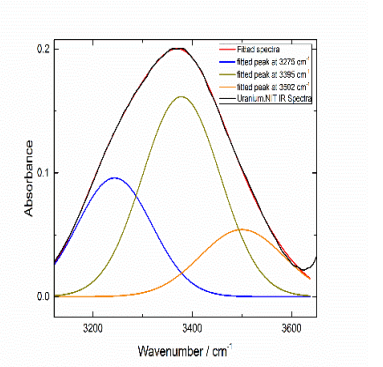
As the area is proportional to the population of the absorption species in the solution it can be concluded that the –OH groups in ethanol are present in the liquid state in different populations. The percentage distribution of the population as calculated from the area values is ~ 53% from strongly H-bonded –OH groups (is greater) > 45% for weakly H-bonded –OH groups>02% for non H-bonded species (free).

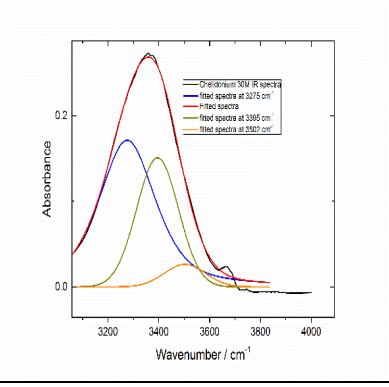
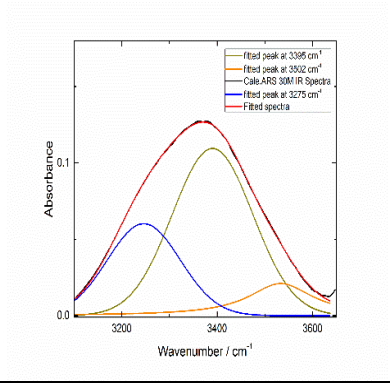
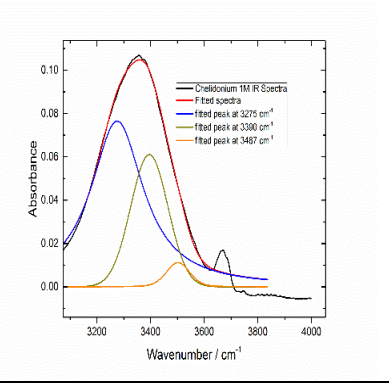
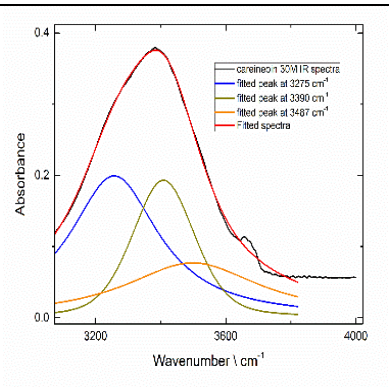
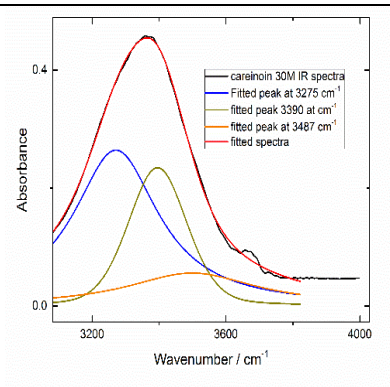
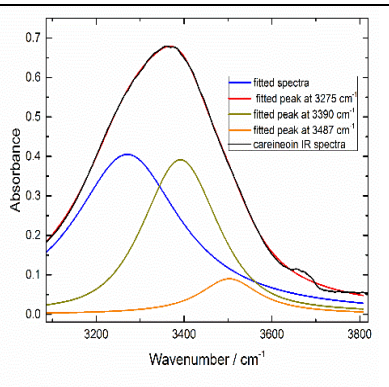
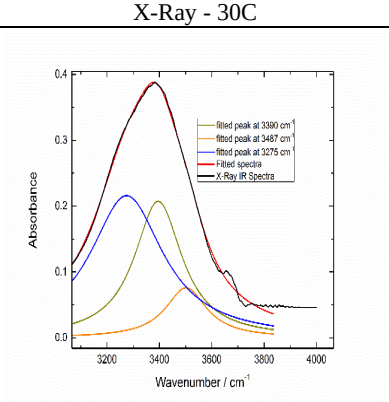
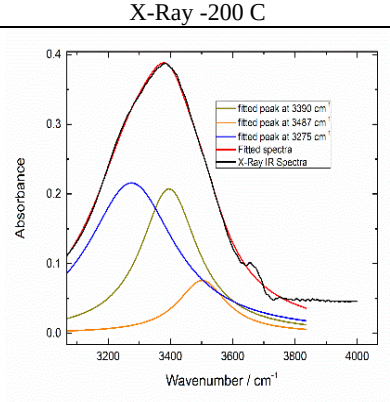
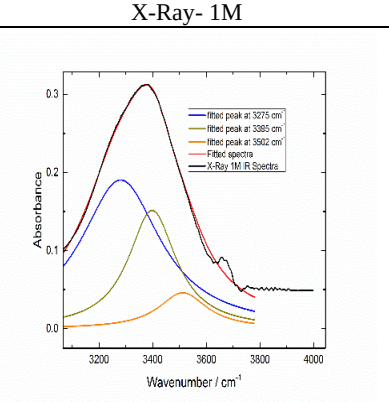
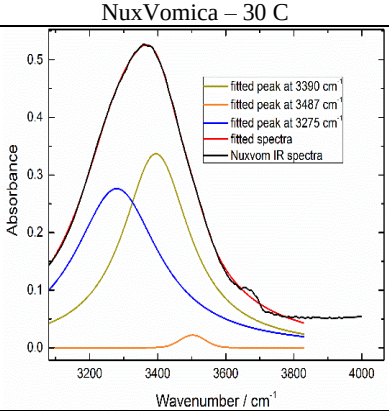
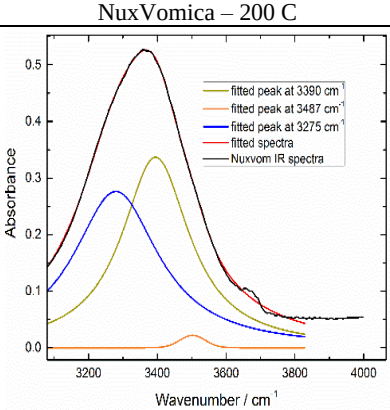
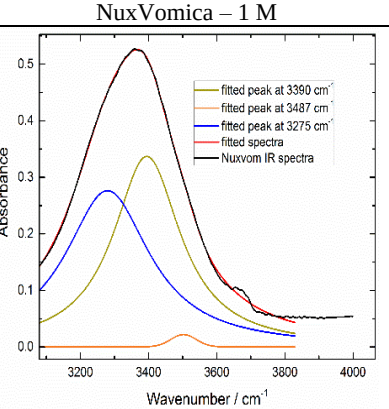
Similarly, the percentage distribution of population of –OH groups of ethanol (the vehicle of drugs) in presence of different drugs at various potencies can also be calculated from the experimentally observed values of the area. The relative percentage in the different cases has been listed in table 1.

Table 1: FTIR spectral properties (peak position/cm^{-1}, band intensity, area, relative area and percentage of population of H-Bond) of various drugs of different potencies in Ethanol at 300

Name	Peak position / cm-1	Intensity	Area	Relative Area	Percentage of population of –OH bond
Ethanol (solvent/ medium)	3279	0.490	168.673	27.995	53.254
	3395	0.509	142.029	23.573	44.842
	3502	0.056	06.025	1.000	1.902
Medicines	3275	0.171	52.217	9.709	58.845
ChelidoniumMajus – 30C	3395	0.151	31.139	5.790	35.093
	3502	0.026	05.378	1.000	06.060
ChelidoniumMajus – 200C	3275	0.100	30.688	9.367	63.073
	3395	0.079	14.691	4.484	30.193
	3502	0.015	03.276	1.000	0.067
ChelidoniumMajus – 1M	3275	0.076	22.834	17.354	65.426
	3395	0.061	10.620	8.069	30.426
	3502	0.011	01.316	1.000	3.770
Chininum Ars. –30 C	3275	0.353	108.76	10.777	49.232
	3395	0.458	102.053	10.113	46.199
	3502	0.073	10.091	01.000	4.568

Chininum Ars. 200 C	3275	0.092	16.377	1.763	33.107
	3395	0.136	23.80	2.562	48.112
	3502	0.049	09289	1.000	18.779
Calcarea Arsenate 30 C	3275	0.072	11.470	02.888	29.754
	3395	0.102	23.106	05.818	59.942
	3502	0.031	03.971	01.000	10.302
Calcarea Arsenate 200 C	3275	0.030	05.933	2.462	41.225
	3395	0.035	06.048	2.510	42.029
	3502	0.012	02.409	1.000	16.744
Carcinosin30C	3267	0.199	72.265	1.879	44.941
	3402	0.193	50.056	1.302	31.140
	3498	0.077	38.440	1.000	29.917
Carcinosin200C	3269	0.264	92.373	3.451	53.215
	3389	0.235	54.439	2.034	31.364
	3579	0.060	26.764	1.000	15.420
Carcinosin – 1M	3275	0.409	137.399	6.873	54.314
	3389	0.388	95.578	4.781	37.782
	3379	0.116	19.991	1.000	7.902
NuxVomica – 30 C	3275	0.246	86.390	3.975	48.784
	3395	0.258	68.965	3.173	38.942
	3502	0.035	21.729	1.000	12.272
NuxVomica – 200 C	3275	0.103	56.522	3.075	50.642
	3395	0.167	18.378	1.000	16.469
	3502	0.061	36.717	1.997	32.888
NuxVomica – 1 M	3275	0.276	95.693	47.209	47.814
	3395	0.337	102.413	50.524	51.172
	3502	0.022	02.027	1.000	1.012
Uranium Nitrate – 30 C	3275	0.227	41.379	2.259	23.876
	3395	0.527	113.571	6.202	65.532
	3502	0.022	18.311	1.000	10.569
Uranium Nitrate – 200 C	3275	0.096	17.963	1.658	29.706
	3395	0.162	31.674	2.924	52.380
	3502	0.004	10.832	1.000	17.913
Magnetis Polus Australis – 200 C (south pole of the magnet)	3275	1.063	309.427	5.907	62.891
	3395	0.785	131.164	2.504	26.607
	3502	0.314	52.375	1.000	10.624
X-Ray – 30 C	3275	0.190	74.139	5.823	57.436
	3395	0.151	42.208	3.315	32.699
	3502	0.046	12.732	1.000	9.863
X-Ray – 200 C	3275	0.190	62.151	1.846	47.128
	3395	0.151	36.064	1.071	27.346
	3502	0.046	33.662	1.000	25.525
	3275	1.143	416.878	11.391	64.595
	3395	0.759	191.889	5.243	29.73
	3502	0.234	36.595	1.000	5.670

Ethanol (solvent/ medium)	Uranium Nitrate – 30 C	Uranium Nitrate – 200 C
		
Chelidonium Majus – 30C	Chelidonium Majus – 200C	Chelidonium Majus – 1M

		
Carcinosin 30C	Carcinosin 200C	Carcinosin – 1M
		
X-Ray - 30C	X-Ray -200 C	X-Ray- 1M
		
NuxVomica – 30 C	NuxVomica – 200 C	NuxVomica – 1 M
		
Chininum Ars. –30 C	Chininum Ars. 200 C	Magnetis Polus Australis – 200 C (south pole of the magnet)

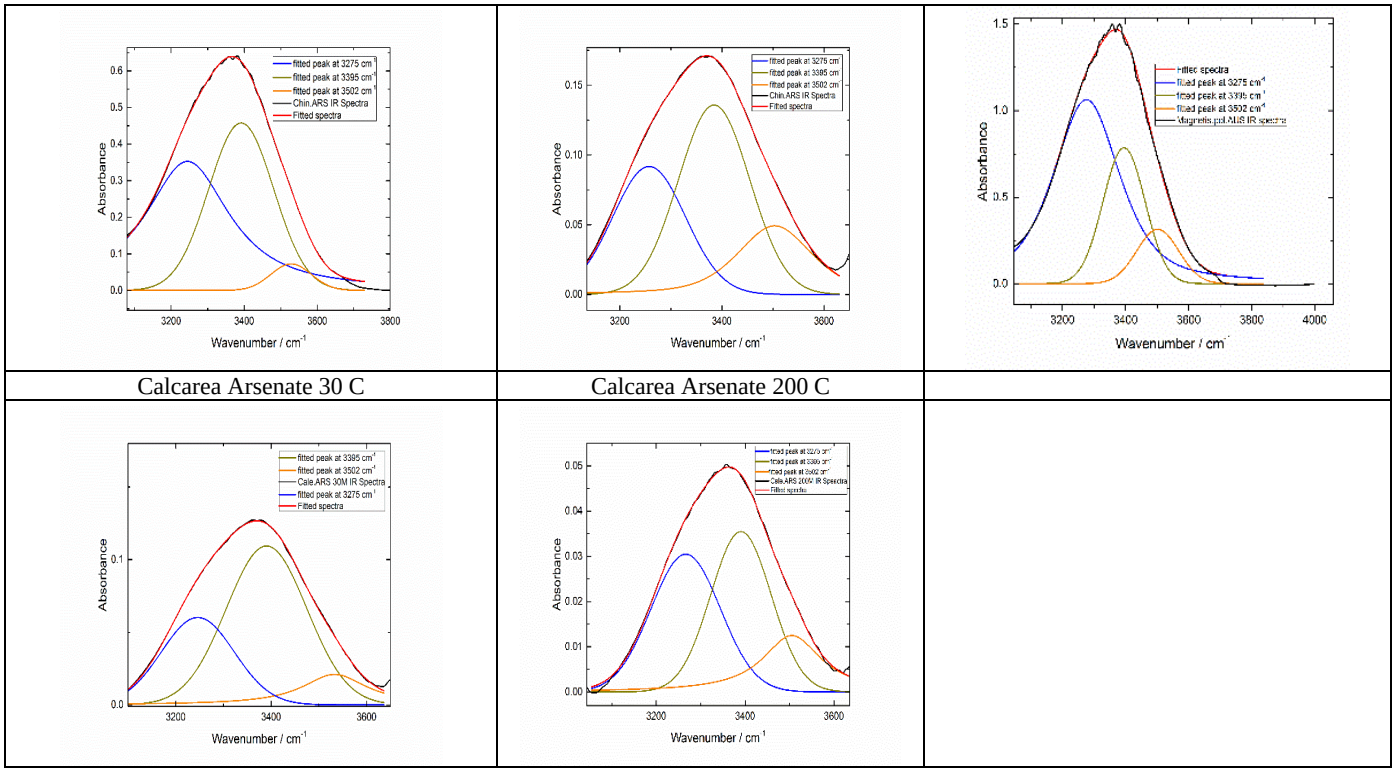


Fig 1

It appears from the table 1that the distribution of population of differently H-bonded –OH groups in the solution are different for different drugs and this is also dramatically different from those in pure ethanol. Thus, in ethanol (91%v/v), the free –OH groups are present in negligible population, whereas, in a drug solution, the population is substantial in almost all the cases. Moreover, the distribution pattern is different for the same drug at different potencies. As it is known that the molecules of drug cannot be present in the dilution studied, our experimental results indicate that the signature of a homoeo drug is present in the distribution of H-bonded –OH groups in the drug vehicle (ethanol). Thus, the distribution pattern serves as the identity of the drugs in different potencies. In this context, we discuss systematically the distribution pattern of the different –OH bonded species for various drugs.

1. Drugs of different potencies: For a particular drug of different potencies and distribution pattern, it is seen that the relative area increases as the potency is increased. Thus, higher the potency, higher will be the relative area and the percentage of distribution of H-bond will also change. These are shown below in the table 2.

Table 2: A. Carcinosin-30C, B. Carcinosin-200C, C. Carcinosin-1M

Name	Peak position / cm-1	Intensity	Area	Relative Area	Percentage of population of –OH bond
A. Carcinosin – 30 C	3267	0.199	72.265	1.879	44.941
	3402	0.193	50.056	1.302	31.140
	3498	0.077	38.440	1.000	29.917
B. Carcinosin – 200 C	3269	0.264	92.373	3.451	53.215
	3389	0.235	54.439	2.034	31.364
	3579	0.060	26.764	1.000	15.420
C. Carcinosin – 1M	3275	0.409	137.399	6.873	54.314
	3389	0.388	95.578	4.781	37.782
	3379	0.116	19.991	1.000	7.902

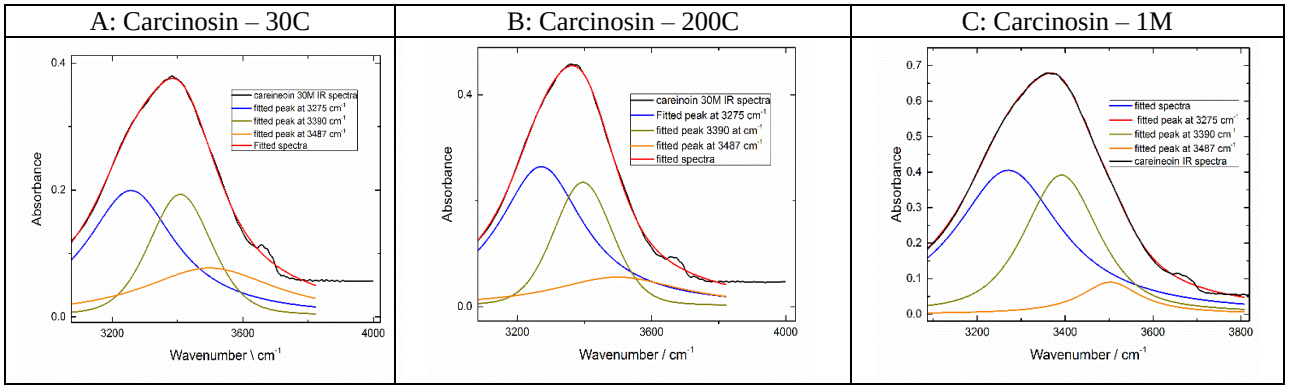


Fig 2: A. Carcinosin-30C, B. Carcinosin-200C, C. Carcinosin-1M

2. For the different drugs for a particular potency: Table 3shows a comparative study of different drugs with the same potency:

Table 3: A. Carcinosin – 200 C, B. Magnetis Polus Australis – 200 C (south pole of the magnet), c. X-Ray – 200 C, d. Nux Vomica – 200 C

Name	Peak position / cm-1	Intensity	Area	Relative Area	Percentage of population of –OH bond
Carcinosin – 200 C	3269	0.264	92.373	3.451	53.215
	3389	0.235	54.439	2.034	31.364
	3579	0.060	26.764	1.000	15.420
Magnetis Polus Australis – 200 C (south pole of the magnet)	3275	1.063	309.427	5.907	62.891
	3395	0.785	131.164	2.504	26.607
	3502	0.314	52.375	1.000	10.624
X-Ray – 200 C	3275	0.190	62.151	1.846	47.128
	3395	0.151	36.064	1.071	27.346
	3502	0.046	33.662	1.000	25.525
Nux Vomica – 200 C	3275	0.103	56.522	3.075	50.642
	3395	0.167	18.378	1.000	16.469
	3502	0.061	36.717	1.997	32.888

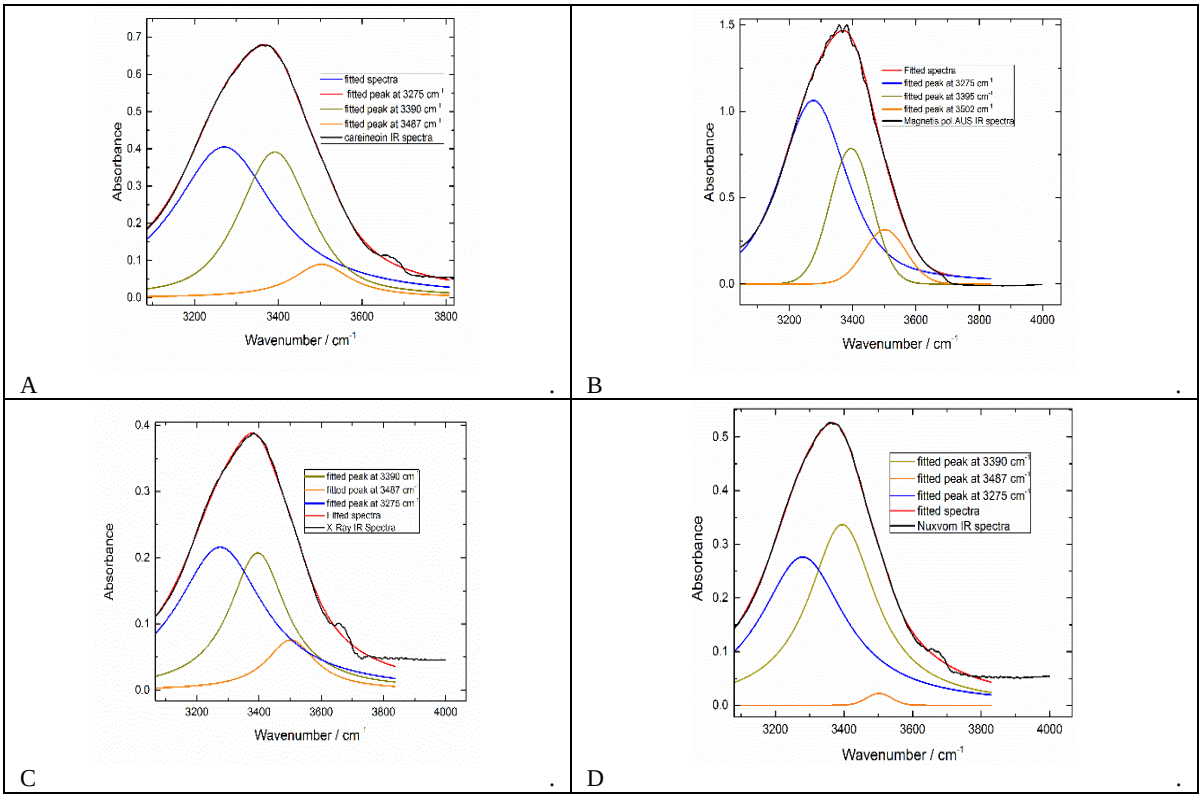


Fig 3: A. Carcinosin – 200C (a nosode), B. Magnetis polus Australis – 200C (Imponderable), C. X-Ray – 200C (Imponderable), D. Nux Vomica – 200C (Plant Kingdom)

Here the drugs are

i. Carcinosin – 200C (a nosode)
ii. Magnetis polus Australis – 200C (Imponderable)
iii. X-Ray – 200C (Imponderable)
iv. NuxVomica – 200C (Plant Kingdom)

Drugs	Relative area
NuxVomica – 200C	1.539
X-Ray – 200C	1.846
Carcinocin – 200C	3.451
Mag. Pol. Aus – 200C	5.907

Here, the relative area of the corresponding drugs Nux Vom – 200C, X-Ray – 200C, Carcinosin – 200C and Mag. Pol. Aus – 200C is in increasing order

The different in relative area values indicate the population of H-bonding with the same stretching frequency begins to increase in the above order in their same potency. i.e., the energy medicines have a greater relative area value than Nux Vomica (drug of plant kingdom). In this context, we can say that the energy medicines are the more deep-acting than Nux Vomica, i.e., X-Ray and Magnet has more energy value than Nux Vom.

3. Same potency of different drugs having shorter and stronger therapeutic activities

We know that in Homoeopathic Materia Medica, some medicines are strongly deep-acting (e.g., Sulphur, Psorinum, Tuberculinum, Medorrhenum,Carcinosin, X-Ray, Lycopodium Clavatum, Thuja Oc., Merc. sol etc). This means that the therapeutic activities of those drugs upon the living organisms are very strong and long acting. Short-acting drugs act through a short periods upon the living organisms. Our experimental data can easily explain this that higher the energy area, higher will be therapeutic activity e.g., Carcinosin is more deep-acting than Calcarea Ars. – 200C (relative area of Carcinosin – 200C is 3.451 and Calacrea Ars. – 200C is 2.462.

Here, band intensities and area measurements can easily explain the causation of their difference in therapeutic characters of the drugs.

From the data analysis of Chelidonium Majus – 200C, Nux Vomica – 200C and Mag. Polus Australis – 200C, we can show the energy increasing order (band intensity, area, relative area, percentage population of H-bonding of ethanol) from chelidonium – 200C to Mag.Pol.Aus. – 200C. These have been illustrated in table 4.

Table 4: A. ChellidoniumMajus – 200C, B. NuxVomica – 200C, C. Magnetis Polus Australis – 200C (South Pole of the magnet)

Name	Peak position / cm-1	Intensity	Area	Relative Area	Percentage of population of –OH bond
A. ChellidoniumMajus – 200C	3275	0.100	30.688	9.367	63.073
	3395	0.079	14.691	4.484	30.193
	3502	0.015	03.276	1.000	0.067
B. NuxVomica – 200 C	3275	0.103	56.522	3.075	50.642
	3395	0.167	18.378	1.000	16.469
	3502	0.061	36.717	1.997	32.888
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	3395	0.785	131.164	2.504	26.607
	3502	0.314	52.375	1.000	10.624

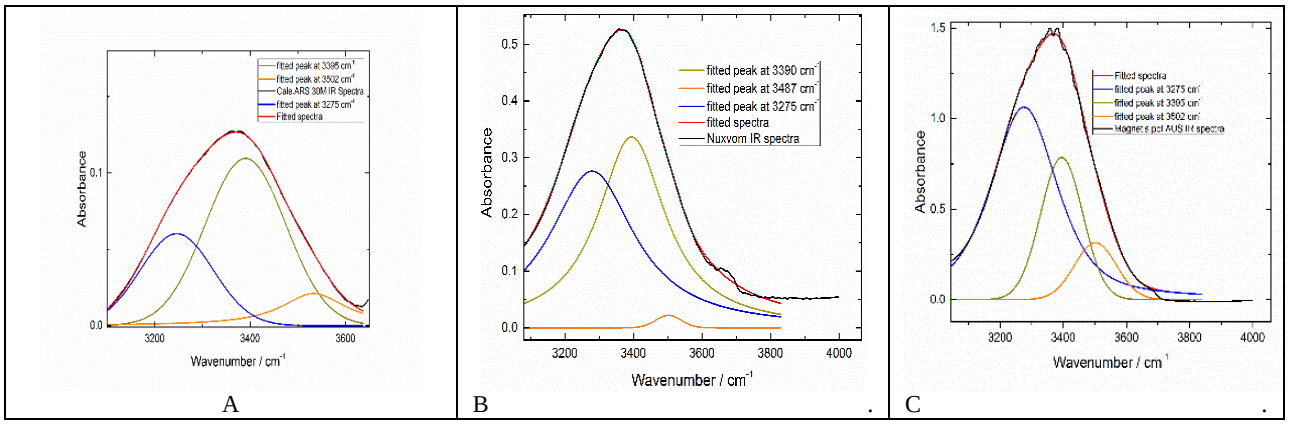

Fig 4: A. ChellidoniumMajus – 200C, B. NuxVomica – 200C, C. Magnetis Polus Australis – 200C (South Pole of the magnet)

In reality, it is found that 'Chelidonium' acts in the living body in very acute diseases (Jaundice, liver diseases etc.) but it cannot cure the very chronic diseases deep-seated in nature. This is due to the lower energy value (area value) of this drug in comparison with Nux Vom and Mag. Polus Aus. So, this can be termed as the short-acting drug. Nux Vomica is moderately deep-acting and Mag. Polus Aus is strongly deep-acting drug.

Therefore, it can cure the innumerable number of diseases (severe uterine hemorrhage, chronic long-standing Arthritis, Impotence, Bone-Carcinoma etc.) in the living body.

4. Comparison of drugs of different kingdom:

There are a larger number of sources of homoeo drugs (different kingdom).

E.g. Vegetable Kingdom – Chelidonium Majus,
Mineral Kingdom – Calcarea Ars,
Nosodes – Carcinosin (a cancer nosode)
Imponderable kingdom - X-Ray, Mag. Polus Aus (S-pole of the Magnet)

Here, we can take the four drugs of same potency.

a. Chelidonium Majus – 30C
b. Calcarea Ars – 30 C
c. X-Ray – 30C and
d. Carcinosin – 30C

Now, we can observe a changes in their energy patterns

(Parameter: band intensity, area, relative area and percentage of population of H-bonding) from the following Table 5.

Table 5: A. Chelidonium Majus – 30C, B. Calcarea Arsenate – 30C, C. X-Ray – 30C, D. Carcinosin – 30C

Name	Peak position / cm-1	Intensity	Area	Relative Area	Percentage of population of –OH bond
A. ChelidoniumMajus – 30C	3275	0.171	52.217	9.709	58.845
	3395	0.151	31.139	5.790	35.093
	3502	0.026	05.378	1.000	06.060
B. Calcarea Arsenate – 30C	3275	0.072	11.470	02.888	29.754
	3395	0.102	23.106	05.818	59.942
	3502	0.031	03.971	01.000	10.302
C. X-Ray – 30C	3275	0.190	74.139	5.823	57.436
	3395	0.151	42.208	3.315	32.699
	3502	0.046	12.732	1.000	9.863
D. Carcinosin – 30C	3267	0.199	72.265	1.879	44.941
	3402	0.193	50.056	1.302	31.140
	3498	0.077	38.440	1.000	29.917

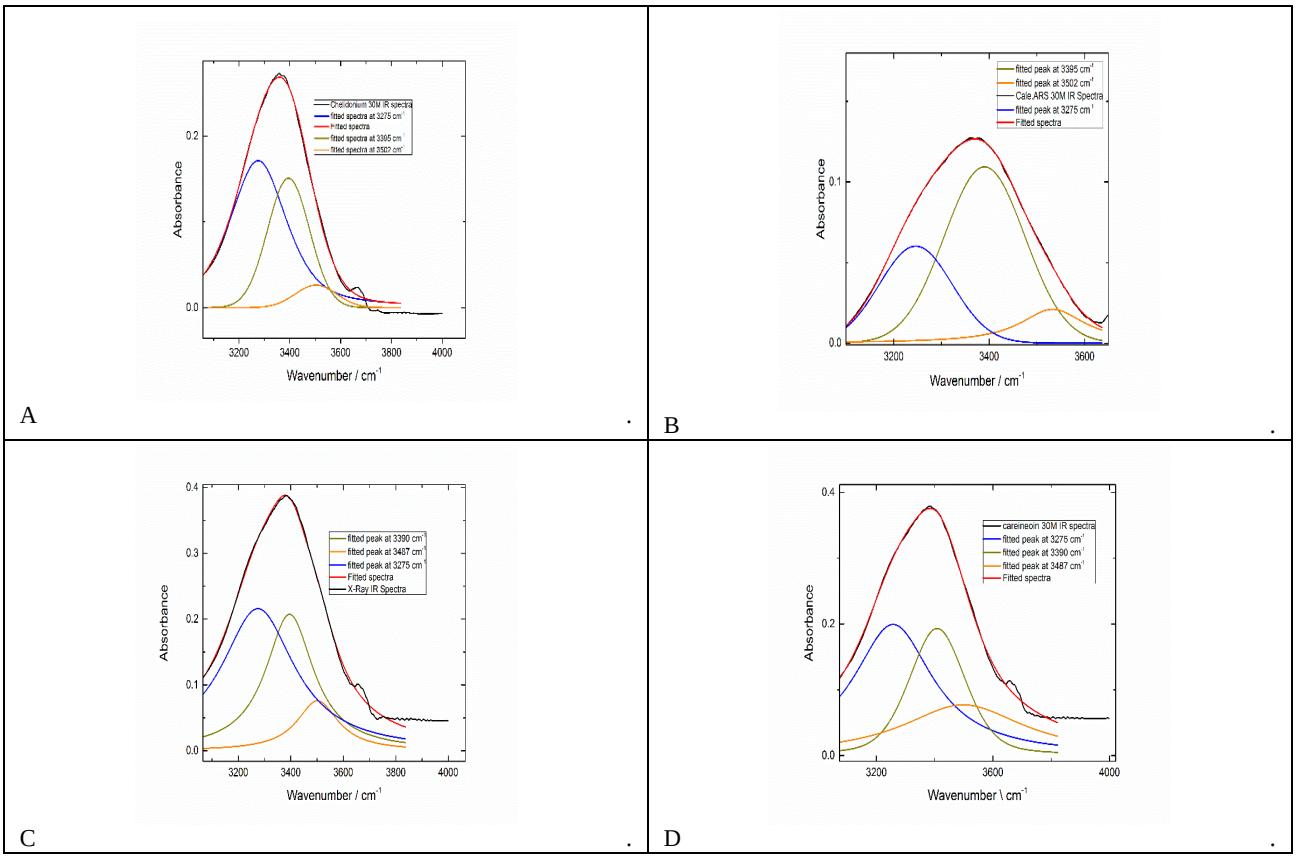

Fig 5: A.ChelidoniumMajus – 30C, B. Calcarea Arsenate – 30C, C. X-Ray – 30C, D. Carcinosin – 30C

From the above data analysis, it is clear that Carcinosin – 30C is in the superior position (Area – 72.265), then X-Ray – 30C (Area – 65.151), Chelidonium Majus – 30C (Area – 52.217) and Calcarea Ars – 30C (Area – 11.470). Here it is found that although each drug possesses the same potency but they create the different area values. This is due to the individual character of the different drugs taken from different sources. The intensity of energy (area value) is dependent upon the structure of the molecules or nature of chemical bonds of the drug substance or radiation frequency if the drug is of energy medicines or imponderable kingdom. So, the pattern of changes in H-bond varies from drug molecules to drug molecules.

5.

6. Special emphasis of deep-acting energy medicines:

E.g., X-Ray – 200C and Magnetis Polus Australis – 200C;

If we compare the two deep-acting energy medicines X-Ray – 200C and Mag. Pol. Aus – 200C with respect to the different parameter (band intensity, area, relative area, percentage of population of the H-bonding of solvent molecules, the value of different parameter of Mag. Pol. Aus – 200C is greater than that of X-Ray – 200C.

This differentiation is shown below in the Table 6.

Table 6: A. Magnetis Polus Australis – 200 C (south pole of the magnet), B. X-Ray – 200C

Name	Peak position / cm-1	Intensity	Area	Relative Area	Percentage of population of –OH bond
A. Magnetis Polus Australis – 200 C (south pole of the magnet)	3275	1.063	309.427	5.907	62.891
	3395	0.785	131.164	2.504	26.607
	3502	0.314	52.375	1.000	10.624
B. X-Ray – 200C	3275	0.190	62.151	1.846	47.128
	3395	0.151	36.064	1.071	27.346
	3502	0.046	33.662	1.000	25.525

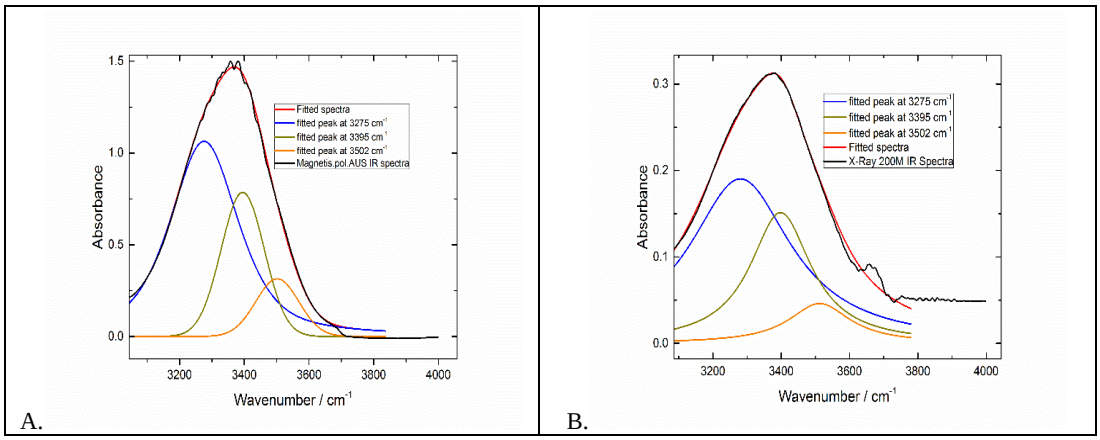

Fig 6: A. Magnetis Polus Australis – 200 C (south pole of the magnet), B. X-Ray – 200C

Conclusion

From the measurement of different parameters (band intensity, area, relative area and distribution pattern of H-bonded – OH groups) by FTIR study on different homoeopathic potentized medicines of different kingdom, we can conclude that the individual character of the drugs is contained in the drug.

During Drug-dynamization the produced energy is transferred and stored in the solvent matrix (ethanol) in the H-bonded network system of the medium (ethanol solution). From the analysis of the spectral data, we can also conclude that the relative population of different H-bonding of each medicine is dependent on the nature of the drug and its potency indication that increased with each medicine possesses an individual character in energy patterns, not in the molecular or nano particle nature. We have measured these energy changes by FTIR Spectroscopic studies.

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