Indian Journal of Research in Homoeopathy
Vol. 2, No. 3, July-September 2008

FUNDAMENTAL RESEARCH

Theory and Instrumentation Related to Potentised Homoeopathic Medicines*†

T Maity, D Ghosh & C R Mahata

Abstract

This paper offers a theory for establishing the scientific basis of homoeopathic medicines followed by an instrumentation technique named as 'dielectric dispersion of ordered molecular groups of sugar of milk caused by potentised homoeo – medicines for verification of the proposed theory. Usually one studies anomalous dielectric dispersion of a material caused by intra-molecular binding forces of separate molecules. The authors of this paper extend this concept to ordered molecular groups. The theoretical analysis suggests that there will be anomalous dielectric dispersion at selected frequencies specific to shape, size and number of atoms in the ordered molecular group of the material. Now, homoeopathic medicines, as is felt by several modern investigators including the authors of this paper, are ordered molecular groups of the vehicle of potentisation. The instrumentation method, supported by the properly developed theory mentioned above, is described in this paper to observe the frequency domain signature of the sugar of milk soaked with homoeopathic medicine. The anomalous dielectric dispersion of the medicine-soaked sugar of milk, which occurred at acoustic resonant frequencies of the material, were observed repeatedly and recorded through the experimental arrangement. The results were further confirmed by blind experiments. Thus the experiments validate the theoretical model. Further, the experimental results and the nature of results obtained from MATLAB – simulation support each other giving additional confidence in the approach.

Keywords : dielectric dispersion; ordered molecular groups; acoustic resonance frequencies; potentised homoeopathic medicines; scientific basis

Notation

C'	:	velocity of sound
C^1, C^2	:	capacitances in the simulation circuits
E	:	electric field incident on the material
f_0	:	frequency
L	:	length of atomic chain
m	:	mass of the oscillator
N	:	no of atoms in a chain
$\vec{P}(\omega)$	:	total dipole moment of the chain consisting of N atoms
q	:	quantity of charge
δ	:	displacement of the oscillator
$\varepsilon(\omega)$	:	complex dielectric function
ε_0	:	dielectric constant at free space
$\varepsilon'(\omega)$	:	real part of the dielectric constant
$\varepsilon''(\omega)$	:	imaginary part of the dielectric constant
γ	:	damping coefficient
λ	:	wavelength
ω_p	:	natural frequency (of the acoustic mode) for chain of atoms

Address for correspondence:
T Maity is with the Department of Electrical Engineering, College of Engineering and Management, Kolaghat, KTPP 721 171, Midnapore (East); Dr D Ghosh is with the Department of Electrical Engineering, Bengal Engineering and Science University, Shibpur, Howrah 711 103; while Dr C R Mahata was with the Department of Electrical Engineering, Bengal Engineering and Science University, Shibpur, Howrah 711 103.

This article was originally published in the journal 'The Institution of Engineers' (INDIA) Vol. 88 November 2007 : Reprinted with the consent of the author and the publisher.

†*This paper was recently awarded a Certificate of Merit by the Institution of Engineers.*

Introduction

Homoeopathic medicines of sufficiently high potency (30th or above) can not even theoretically contain atoms/molecules of the original medicinal substances. Even then, curative effect of these medicines is beyond any doubt. So, the question is: wherein lies the medicinal value of sufficiently potentised (loosely called as diluted) homoeopathic medicines? And how to establish it scientifically? These are dealt within three steps;

- Logical necessities leading to a theory.
- Theoretical analysis and its fall out.

- Validation of theoretical indications by appropriate instrumentation as well as MATLAB – simulation.

Logical Necessities Leading to a Theory

This question about medicinal value of sufficiently potentised homoeopathic medicines has been addressed in Mahata[1,–4,] in reasonable details and very extensively. The outcome is a theoretical model which states[4] that the medicinal value of a sufficiently potentised homoeo– medicine owes its origin not to chemical presence of the original substance with which the shock dilution starts but to structural modification of the atoms/molecules of the vehicle and creating specific type of macromolecules peculiar to the original substance as well as the degree of dilution carried over. In advancing this hypothesis one has to remember that homoeopathic arsenal contains a vast number of medicines as well as potencies. So, water must carry some reasonably stable imprint or code related to any medicine of any potency at room temperature. The supporting arguments and facts run like this[1].

A. At room temperature ordinary water contains innumerable tiny floating ice crystals or icicles[5, 6, 7.] This satisfies the requirement of stable structures.

B. Forms of these crystals are so varied in number that practically no two ice-crystals are identical[6]. This satisfies the requirement of large number of forms.

C. The shape and size of these molecular clusters are influenced by impurities, ions of other substances and even foreign molecules[6, 8]. This satisfies the requirement of specificity of structures with original medicinal substance.

Several modern research workers also have a similar feeling. For example, the model which is proposed in Olga,et al[9] is that of the solute altering the dynamics of hydrogen–bonded cluster formation in water. This hydrogen bond network is capable of storing the information of the solute. In the second part of this investigation[10] the researchers measured the transverse relaxation time of water protons (T2) in the solutions of several homeopathic remedies as a function of aerosol content. Even with concentration of the active substance in the studied solutions next to zero, the obtained results give evidence that it is not a particular substance that is active in homeopathy, but the solution as a whole.

Again, the 'thermo–luminescence' study by Rey Louis[11] suggests water to have a memory of molecules that have been diluted away. Historically, there had been many other theoretical and experimental explanations submitted by different researchers since last 50 years from different areas of science, which is briefly reported in a review paper[12]. But these methods lacked the promise of proper identification of potentised homoeo medicines. In sharp contrast to this, the technique described in this paper makes the desired identification quite simple. Theory part of this technique is described and the instrumentation part later. It is based on anomalous dielectric dispersion of ordered molecular groups around their acoustic resonance frequencies.

Dielectric behaviours of different non–homeopathic and non–medicinal substances both in solid and liquid forms are reported in different research works. In Midmore, et al[13] measurements are carried out on the basis of the effect of particle volume fraction on the dielectric response of concentrated lattices in the frequency range1Hz–10MHz, a range where the theory predicts large dielectric dispersion effects.

Again, an automated measurement system, based on the lock–in amplifier, is developed in order to expedite the dielectric response of ice[14]. Similarly, there are many research works revealing dielectric dispersion effects on the different type of organic and inorganic materials. But no such report is found on dielectric behaviour of superdiluted substances like homoeo–medicines.

The present investigators studied dielectric dispersion effect in regular crystalline structures like IC chip, which are reported in earlier works[15, 16, 17]. The present papers a continuation of same kind of investigation in ordered molecular groups. That homoeo–medicines can not be anything except specifically ordered molecular groups, is theoretically proposed by Mahata, et al [1–4 and 9, 10, 12]. The present work seems to support that theoretical model.

Theoretical Analysis and Its Fall Out

The information on size of the molecular clusters as proposed earlier can be obtained from their data on anomalous dielectric dispersion. The phenomenon of dielectric dispersion in its simplest form can be explained by taking a finite linear chain of identical lattice atoms as shown in Figure 1. The atoms (each of mass m and charge q) are considered to be connected by (conceptual) springs according to the Lorentz model. They can be forced to oscillate in an alternating electric field producing alternating (with respcet to time) dipoles. Their motion is affected by friction in the guise of a damping force. The equation of motion becomes,

$$\left(d^2\delta/dt^2\right) + \gamma\left(d\delta/dt\right) + \omega_p^2\delta = \left(q/m\right)E$$

where δ is the displacement of the oscillator, γ, the damping coefficient ωp, the natural frequency (of the acoustic mode) for chain of atoms, E is the electric field incident on the material. For natural frequencies of vibration the length of chain, L is integral multiples of he half wavelength, λ/2. The wavelength, l and frequency, f_0 (= $\omega_0/ 2\pi$) are related by λf_0 =c′=velocity of sound in the media[18]. The electric field is assumed to be time harmonic with frequency ω.

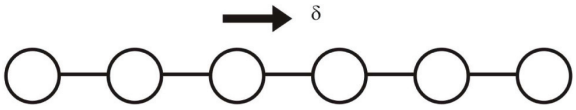

Figure 1 : Simple chain lattice of identical atoms

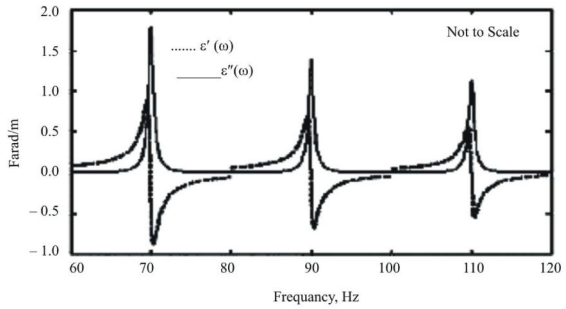

Figure 2 : The variation of the real and imaginary parts of the ielectric function (ε′ and ε″) against frequency ω

Now, using these values in equation (1), the solution of δ can be found as

$$\vec{\delta} = \frac{q}{m} \cdot \frac{\vec{E}}{(\omega_p^2 - \omega^2) + j\gamma\omega} \qquad (2)$$

Hence the total dipole moment of the chain consisting of N atoms, is

$$\vec{p}(\omega) = \sum_{n=1}^{N} q\vec{\delta} = \left[\frac{q^2}{m} \cdot \frac{1}{(\omega_p^2 - \omega^2) + j\gamma\omega}\right] \cdot \sum_{n=1}^{N} E_n$$

It is related to dielectric constant as

$$\varepsilon(\omega)E = \varepsilon_0 E + P(\omega)$$

Here, ε (ω) is complex dielectric function of medium and ε_0 the dielectric constant of the vacuum. Finally the real and imaginary parts of the complex dielectric function are given as

$$\varepsilon'(\omega) = \varepsilon_0 + \frac{q^2}{m} \cdot \frac{(\omega_p^2 - \omega^2)}{(\omega_p^2 - \omega^2)^2 + \gamma^2\omega^2}$$

and

$$\varepsilon''(\omega) = \frac{q^2}{m} \cdot \frac{\gamma\omega}{(\omega_p^2 - \omega^2)^2 + \gamma^2\omega^2},$$

respectively and they are presented graphically in Figure 2. The sharp changes of dielectric function of ordered molecular group around the acoustic resonance frequency is the fall out of theoretical analysis.

Validation of Theoretical Indications by Appropriate Instrumentation as well as MATLAB – Simulation

Sharp change of dielectric function of ordered molecular groups around acoustic resonance frequencies is the fall out of theoretical analysis. Now, capacitance of a capacitor is a function of its dielectric constant. So, when a capacitor is formed with a substance having ordered molecular group (linear chain of Figure 1 is the simplest illustration of such a group) as its dielectric material, it will have sharp change of its capacitance value and consequent sharp change of magnitude and/or phase – shift of current drawn by the capacitor from the exciting signal around the resonance frequencies. Therefore, using potentised homoeo–medicine (which are nothing but ordered molecular groups of the vehicle) as the dielectric substance of a capacitor sharp changes of capacitor – current around these acoustic resonance frequencies will be obtained. This forms the basis of the experimental technique adopted here.

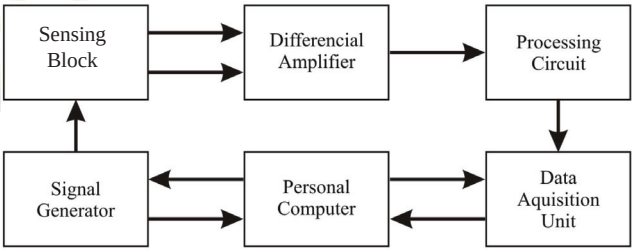

Figure 3 : The block diagram of the experimental arrangement

Block diagram of the experimental arrangement is given in Figure 3. The signal generator is Agilent make model– 8648 A having a frequency stability better than 1 ppm, a frequency range of 100 kHz to 1 GHz and minimum step of frequency variation as 1 mHz only. It is interfaced with a personal computer (PC) through general purpose interface bus (GPIB) for varying frequency of exciting signal by Agilent – developed VEE pro – software. The same PC also controls the Agilent make data acquisition unit, model 34970 A, through another GPIB bus. A user– friendly graphic display is obtained on the PC screen. The sensing block, differential amplifier and the processing circuit are locally fabricated and are as described below.

The sensing block comprises of a pair of capacitors. One contains the sample as its dielectric

material, which is prepared by soaking powder form of sugar of milk ie, lactose (manufactured by M/s HMS, Holland) with potentised medicine in liquid form (made by M/s Hahnemann Publishing Company, Calcutta) plus distilled water in the ratio of 1:10 and subsequently dried up at room temperature. This is called the test or sample cell. The other cell contains sugar of milk soaked with only distilled water and dried up at room temperature. This is called the reference cell. Powder form of sugar of milk is used for two reasons, such as, a solid substance is easier to handle as a dielectric and secondly, it is being successfully used as a standard preservative for homoeopathic medicines from Hahnemann's time. Scientific support behind this is that all the bio – molecules fit in nicely within the hollows of water crystals implying that molecular clusters of water can suitably bend the molecular structure of sugar of milk, which is like imparting an imprint to it. Outputs of the sensing block are fed to two inputs of a Differential amplifier using an AD 8009 IC chip manufactured by M/s Analog Devices. This arrangement continuously compares the output of the active cell with that of reference cell used as a control. The processing circuit comprises of (a) three stages of ac amplifier, (b) an analog multiplier, (c) passive low pass filters and (d) a dc instrumentation amplifier. The processing circuit as a whole amplifies the weak output of the differential amplifier, improves the signal to noise ratio and gives the final output as a dc voltage, which is fed to the data acquisition unit for getting a continuous strip – chart type record. The IC chips used in the processing circuit are AD 8009, AD 834 and AD 524 (all manufactured by M/s Analog Devices). It is followed by a dc amplifier for increasing the overall gain of the system and serving as a buffer between the instrumentation amplifier and the data acquisition unit following it.

Plain Sugar	Reference / Control	Sulphur of Potency		Phosphorus of Potency	
		30	200	30	200
		Resonance frequency, kHz			
111	243.8	173.5	150.2	187.9	334.9
124		219.1	180.1	456.3	364.5
220		238.2	256.7	517.5	395.6
		266.9	347.5	534.8	429.7
		292.5	385.0	593.6	548.3
		365.2	502.2	606.9	567.1
		446.2	536.5	630.2	614.0
		552.5	–	823.6	633.1
				960.0	664.0
					708.2

Results and Discussion

The differential spectra or frequency–domain signatures of the samples are recorded through continuous scan by the PC–operated data acquisition unit. These experiments were performed in three levels:

1. In the first level experiments were carried out for crystalline structures with known dimensions to establish the correctness of our approach and proper functioning of the instrumentation system. First dielectric dispersion phenomenon was observed for the silicon structure inside IC – chips[15].
2. The second level of experimentation was performed using normal commercial grade sugar sample (approximate size 1.1 mm X 1.2 mm X 1.1 mm) in place of sugar of milk in the reference cell, the other cell remaining open. For these experiments the input signal amplitude was set at – 8.0 dB and the frequency– step was selected as 10Hz. The duration of excitation at each frequency was set at 500 ms. The experiment was carried out in a stable temperature environment condition (25°C). Now, during scan, the sharp changes of voltage levels were observed at selective frequencies seemingly due to dielectric dispersion. The occurrence of the peaks was repeated with every fresh sample of sugar. But for the same sample, it is observed that after a few runs the repetition does not occur and the sugar gets visually discolored (brownish). This is indicative of softness of the structures and their destruction due to the stress of alternating electric field. The result for sugar is shown in first column of Table 1.
3. The third level of experimentation used the sample cell and reference cell as described earlier. The signal amplitude was set at –3.1dB. The observation of dielectric dispersion in the form of change of voltage level for four different potentised homoeo–medicines are given in last four columns of Table 1. Discoloration of sugar of milk is observed here also after a few runs. Results are repetitive for every fresh sample of medicine. 'Blind' testing gave the same results. All the medicines used in these experiments are Manufactured by M/S Hahnemann Publishing Company, Calcutta.

Simulation Results

Based on the earlier discussions the experimental instrumentation can be simulated by MATLAB software. The 'test' cell had $C_1 = K(\varepsilon' + j\varepsilon'')$, (where K= a constant) $\varepsilon = \varepsilon' + j\varepsilon''$. had a plot against frequency as shown in Figure 2.The capacitor C_2 for the 'standard' cell has a dielectric, the permittivity of which was kept constant with respect to frequency. Expression for the output is

found by circuit analysis. Now, taking the help of MATLAB software, the voltage V_o is plotted as a function of frequency ω. The result showed sharp change of V_o at the resonant or natural frequency.

Conclusion

The experimental results and the nature of results obtained from simulation support each other. They prove the correctness of the direction of investigation for scientific basis of homoeopathic medicines. The frequency domain signature is specific to medicine along with its potency. That is the clue to detection and/or identification of potentised homoeopathic medicines. Although sufficiently potentised homoeo – medicines can not contain any atoms/molecules of the original medicinal substances, their claim to be recognized as genuine medicines is expected to be strengthened by this research work.

Acknowledgement

The authors take the opportunity to acknowledge the support extended by M/s Analog Devices, USA in providing the free samples of some IC chips.

References

1. C R Mahata. 'Scientific basis of Potentised Homoeopathic Medicines –Theoretical Position and Direction of Future Research.' *Indian Journal of Classical Homoeopathy,* 2000 – 2001, pp 33–36.
2. C R Mahata. 'Homoeopathy Explained in the Light of Recognized Science.' *The Homoeopathic Heritage*, vol 22, 1997, pp 245–252.
3. C R Mahata. 'Some Studies on Physical basis of Homoeopathic Medicines.' *Journal of Technology*, vol 29, no 1, 1983, pp 27–34.
4. C R Mahata. 'Science and Philosophy of Medicines.' *Journal of National Institute of Homoeopathy*, vol S1, no 1, 1993, pp 1–110.
5. M Karapetyants and S Drakin.'Structure of Matter.'Mir Publishers, Moscow, 1974, p 258.
6. W Finkelnburg. 'Structure of Matter.' Academic Press, New York, 1964, pp 412 – 414.
7. B Sergeev. 'Physiology for Everyone.' Mir Publishers, Moscow, 1971, pp 11–16.
8. P P Singh and H L Chhabra. 'Topological Investigation of the Ethanol/Water System and Its Implication for the Mode of Action of Homoeopathic Medicines.' *British Homoeopathic Journal*, vol 82, no 3, 1993, pp 164 –171.
9. Olga Zhalko – Tytarenko1, Gabo Lednyiczky and Sean Topping. 'Towards a Biophysics of Homeopathy I Conceptual Approach.' *Journal of Advancement in Medicine, Springer*, vol 11, no 1, 1998, pp 27–33.
10. Olga Zhalko – Tytarenkol, Gábor Lednyiczky and Sean Topping. 'Towards a Biophysics of Homeopathy II Experimental Evidence.' *Journal of Advancement in Medicine, Springer*, vol 11, no 2, 1998, pp 135 –140.
11. Rey Louis. 'Thermoluminescence of Ultra–high Dilutions of Lithium Chloride and Sodium Chloride.' Physica A, vol 323, 2003, pp 67–74.
12. J R Benneth. 'Seven Kinds of Provings for Homoeopathy.'
13. B R Midmore, R J Hunter and R W O'Brien. 'The DielectricResponse of Concentrated Lattices.' *Journal of Colloid and Interface Science*, vol 120, no 1, 1987, pp 210 – 217.
14. Robert K Svec. Bulk and Surface Dielectric Dispersion of Water Ice M S.' Geophysics Program Independent Study Report, 1993.
15. T Maity, D Ghosh and C R Mahata. 'Effects of Dielectric Dispersion in Multiplier Chips.' *Journal of Solid State Electronics*, vol 49, no 10, 2005, pp 1649 –1654.
16. T Maity, D Ghosh and C R Mahata. 'Dielectric Dispersion Effects in Multiplier Chips.' Proceedings of International IEE Conference on Energy, Information Technology and Power Sector (PEITSICON 2005), Kolkata, 2005, pp 76 –78.
17. T Maity, A Sutradhar, D Ghosh and C R Mahata. 'Anomalous Behaviour of Analog Multiplier Chips.' Proceedings of National Conference on Power, Signal Processing, Control.' APSC 2004, Rourkela, pp 99–102.
18. Kireev. 'Semiconductor Physics.' MIR Publishers, Moscow, 1974, p 409.