Characterization of the Physicochemical, Structural, and Thermal Properties of Zinc Chloride After the Consciousness Energy Healing Treatment

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Abstract: Zinc chloride is used as a source of zinc in various pharmaceutical/nutraceutical formulations. The aim of the current study was to investigate the impact of The Trivedi Effect® - Consciousness Energy Healing Treatment (Biofield Energy Treatment) on physical, structural, thermal, and behavioral properties of zinc chloride using PXRD, PSD, FT-IR, UV-vis, and DSC analysis. Zinc chloride was divided into two parts – one part was control, while another part was treated with The Trivedi Effect® - Consciousness Energy Healing Treatment remotely by twenty renowned Biofield Energy Healers and defined as the Biofield Energy Treated sample. A significant alteration of the crystallite size and relative intensities of the PXRD peaks was observed in The Trivedi Effect® treated sample compared with the control sample. The average crystallite size of the treated sample was significantly increased by 16.43% compared with the control sample. The particles size values of the treated sample at d₁₀ was decreased by 2.42%, whereas at d₅₀ and d₉₀ it was increased slightly by 0.43%, and 0.57%, respectively compared to the control sample. Therefore, the surface area of the treated sample was increased by 1.63% compared with the control sample. The FT-IR spectroscopic analysis revealed that Zn-Cl stretching in the control sample was found at 511 cm⁻¹, whereas it was shifted downward to 508 cm⁻¹ in the treated sample. The UV-vis analysis exhibited that wavelength of the maximum absorbance (λₘₐₓ) of the control and treated samples were at 196.4 nm and 196.2 nm, respectively. The DSC analysis exhibited that the melting temperature was not altered significantly, while the decomposition temperature was increased by 0.45% in the treated sample compared to the control sample. The latent heat of fusion of the treated sample (402.09 J/g) was significantly increased by 29.78% compared with the control sample (309.83 J/g). Similarly, the enthalpy of decomposition of the treated sample (243.13 J/g) was significantly decreased by 61.18% compared with the control sample (626.37 J/g). This indicated that the thermal stability of the treated sample might be improved compared to the control sample. The current study anticipated that the Consciousness Energy Healing Treatment might lead to produce a new polymorphic form of zinc chloride, which would be more soluble, bioavailable, and thermally more stable compared with the control sample. Hence, the treated zinc chloride would be very useful to design better nutraceutical/pharmaceutical formulations that might offer better therapeutic response against immunological disorders, inflammatory diseases, stress, aging, cancer, etc.
Keywords: Zinc Chloride, Biofield Energy Healing Treatment, Consciousness Energy Healing Treatment, Biofield Energy Healers, The Trivedi Effect®, PXRD, Particle size, DSC

1. Introduction

Zinc is an essential element in the human body, which regulates a broad spectrum of physiological functions. It plays an important role in the human body, which are involved in the nucleic acid, protein metabolism and for the production of energy. Zinc also maintains the structural integrity of the biological membranes resulting in their protection against oxidative injury [1-2]. It possesses various pharmacological activities include retino-protective, fertility attenuation, and putative antiviral activities [3]. Zinc is also used in the treatment of Wilson’s disease [4]. It has also immunomodulatory and antioxidant activities [1]. Zinc also prevent the development of several deficiency symptoms include hypogeusia, parakeratosis, anorexia, geophagia, dysosmia, growth retardation, hypogonadism, etc. [5-7]. Recently, it has been reported that zinc had increased the phagocytic index, and leukocyte count which potentiate the immunomodulatory effect along with Glycyrrhiza glabra [8]. Zinc chloride (ZnCl₂) is a hygroscopic inorganic salt and highly soluble in water [9]. It is used in pharmaceutical industry as drug and diagnostic agent due to its powerful astringent and mild antiseptic properties [10]. It is also used in deodorant and mouth-wash preparations. Zinc chloride is used as dentin desensitizer i.e. reduces the sensitivity of the teeth to heat and cold, along with protein precipitation and insulin preparation [10, 11]. The literature reported that zinc chloride has also been used in the treatment of cancer as a destructive agent [12] and in the pluripotency maintenance of mouse embryonic stem cell through the regulation of STA T3 signaling pathway [13]. Zinc chloride can be used for the palliative treatment of canine and malignant skin wounds [14]. It has the reverse effect on the locomotor behavior of rats [15]. Therefore, zinc chloride was considered as one of the components in the novel proprietary herbomineral formulation for the source of zinc and can be used for the prevention and treatment of various human disorders.

An élan vital or vital force which contributes the ‘life’ is preserved by every living organisms and known as prana by the Hindus, qi or chi by the Chinese, and ki by the Japanese. This is believed to co-relate with the soul, spirit, and mind. This hypothetical vital force is considered as one of the components in the novel proprietary herbomineral formula for the source of zinc and can be used for the prevention and treatment of various human disorders.

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2.2. The Trivedi Effect® Energy of Consciousness Healing Treatment Strategies

Zinc chloride was one of the components of the new proprietary herbomineral formulation, developed by our research team and it was used per se as the test compound for the current study. The test compound was divided into two parts, one part of the test compound did not receive any sort of treatment and was defined as the untreated or control zinc chloride sample. The second part of the test compound was treated with The Trivedi Effect® Energy of Consciousness Healing Treatment (Biofield Energy Treatment) by a group of twenty renowned Biofield Energy Healers remotely and was denoted as Biofield Energy Treated or The Trivedi Effect® sample. Fifteen Biofield Energy Healers were remotely located in the U.S.A., two in Canada, one in the UK, one in Australia, and one in Germany, while the test compound was located in the research laboratory of GVK Biosciences Pvt. Ltd., Hyderabad, India. This Biofield Energy Treatment was provided for 5 minutes through Healer’s Unique Energy Transmission process remotely to the test compound under the laboratory conditions. None of the Biofield Energy Healers in this study visited the laboratory in person, nor had any contact with the compounds. Similarly, the control compound was subjected to “sham” healers for 5 minutes, under the same laboratory conditions. The sham healer did not have any knowledge about the Biofield Energy Treatment. After that, the Biofield Energy Treated and untreated samples were kept in similar sealed conditions and characterized thoroughly by PXRD, PSD, FT-IR, UV-visible spectroscopy, and DSC analysis.

2.3. Characterization

2.3.1. Powder X-Ray Diffraction (PXRD) Analysis

The PXRD analysis was accomplished on PANalytical X’Pert Pro powder X-ray diffractometer system. The X-ray of wavelength 1.54056 Å was used. The data was collected in the form of a chart of the Bragg angle (2θ) vs. intensity, and a detailed table containing information on peak intensity counts, d value (Å), relative intensity (%), full width half maximum (FWHM) (θ°). From the PXRD results, the crystallite size (G) was calculated using X’Pert data collector and X’Pert high score plus processing software. The crystallite size (G) was calculated from the Scherrer equation [43, 44]. The method was based on the width of the diffraction patterns obtained in the X-ray reflected the crystalline region. The crystallite size (G) was calculated by using the following formula (1):

\[ G = \frac{k\lambda}{(b\cos \theta)} \]  

Where, k is the equipment constant (0.5), \( \lambda \) is the X-ray wavelength (0.154 nm); b in radians is the full-width at half of the peaks and \( \theta \) the corresponding Bragg angle.

Percent change in crystallite size (G) was calculated using following equation (2):

\[ \% \text{ change in crystallite size} = \left(\frac{G_{\text{Treated}} - G_{\text{Control}}}{G_{\text{Control}}}\right) \times 100 \]  

Where, \( G_{\text{Control}} \) and \( G_{\text{Treated}} \) are the crystallite size of the control and Biofield Energy Treated samples, respectively. 

A total of ~500 mg of the control and Biofield Energy Treated samples individually were used for the analysis and prepared by back loading technique using the sample preparation kit. The sample was spread on the holder ring in sufficient quantity to fill the ring cavity. It was then pressed down using powder press block and scrap the powder that was in surplus using a glass slide to get densely packed specimen. Consequently, the bottom plate was placed onto the holder ring and clamp in position. The sample holder was then removed from the sample preparation table by turning it upside down. A smooth surface of the sample was obtained to ensure optimum results.

2.3.2. Particle Size Distribution (PSD) Analysis

The average particle size and particle size distribution were analyzed using Malvern Mastersizer 2000, UK with a detection range between 0.01 µm to 3000 µm. The sample unit was filled with the dispersant medium (sunflower oil) and operated the stirrer at 2500 rpm. Alignment of the optics was done and the background measurement was taken. After the background measurement, the sample was added into the sample unit with constant monitoring the obscuration and stopped the addition of sample when the obscuration reached in between 15% to 20%. When the obscuration was stable, the measurement was taken twice and the average of two measurements was taken. The average histogram of the two measurements was recorded. The data was presented in the table format which includes particle size (µm). Also, the values at below 10% level (d_{10}), 50% level (d_{50}), and 90% level (d_{90}) were calculated from the histogram and the calculations such as surface area (m²/g) were done by using software Mastersizer 2000.

Percent change in particle size (d) for at below 10% level (d_{10}), 50% level (d_{50}), and 90% level (d_{90}) was calculated using following equation (3):

\[ \% \text{ change in particle size} = \left(\frac{d_{\text{Treated}} - d_{\text{Control}}}{d_{\text{Control}}}\right) \times 100 \]  

Where, \( d_{\text{Control}} \) and \( d_{\text{Treated}} \) are the particle size (µm) for at below 10% level (d_{10}), 50% level (d_{50}), and 90% level (d_{90}) of the control and Biofield Energy Treated samples, respectively.

Percent change in surface area (S) was calculated using following equation (4):

\[ \% \text{ change in surface area} = \left(\frac{S_{\text{Treated}} - S_{\text{Control}}}{S_{\text{Control}}}\right) \times 100 \]  

Where, \( S_{\text{Control}} \) and \( S_{\text{Treated}} \) are the surface area of the control and Biofield Energy Treated samples, respectively.

2.3.3. Fourier Transform Infrared (FT-IR) Spectroscopy

FT-IR spectroscopy of zinc chloride was performed on Spectrum two (Perkin Elmer, USA) Fourier transform

\[ \% \text{ change in particle size} = \left(\frac{d_{\text{Treated}} - d_{\text{Control}}}{d_{\text{Control}}}\right) \times 100 \]  

Where, \( G_{\text{Control}} \) and \( G_{\text{Treated}} \) are the crystallite size of the control and Biofield Energy Treated samples, respectively.

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Where, \( G_{\text{Control}} \) and \( G_{\text{Treated}} \) are the crystallite size of the control and Biofield Energy Treated samples, respectively.
infrared spectrometer with the frequency array of 400-4000 cm$^{-1}$ by using pressed KBr disk technique.

2.3.4. Ultraviolet-Visible Spectroscopy (UV-Vis) Analysis

The UV-Vis spectral analysis was carried out using Shimadzu UV-2450 with UV Probe, Japan. The spectrum was recorded using 1 cm quartz cell that has a slit width of 1.0 nm. The wavelength range chosen for recording the spectra was 190-800 nm. The absorbance spectra (in the range of 0.2 to 0.9) and wavelength of maximum absorbance ($\lambda_{\text{max}}$) were recorded.

2.3.5. Differential Scanning Calorimetry (DSC)

The analysis was performed using the DSC Q20 (TA Instruments, USA) differential scanning calorimeter. A total of ~5 mg sample was weighed and sealed in aluminum pans. A total of 20-40 mg sample was weighed and sealed in aluminum pans and equilibrated at 25°C and heated up to 450ºC at the heating rate of 10ºC/min under nitrogen gas as purge atmosphere with a flow rate of 50 mL/min. The value for onset, endset, peak temperature, peak height (mJ or mW), peak area, and change in heat (J/g) for each peak were recorded.

Percent change in the melting/decomposition temperature (T) was calculated using following equation (5):

\[
\% \text{ change in melting/decomposition temperature} = \frac{T_{\text{Treated}} - T_{\text{Control}}}{T_{\text{Control}}} \times 100
\]  

(5)

Where, $T_{\text{Control}}$ and $T_{\text{Treated}}$ are the decomposition temperature of the control and Biofield Energy Treated samples, respectively.

Percent change in the enthalpy of melting/decomposition ($\Delta H$) was calculated using following equation (6):

\[
\% \text{ change in enthalpy of melting/decomposition} = \frac{\Delta H_{\text{Treated}} - \Delta H_{\text{Control}}}{\Delta H_{\text{Control}}} \times 100
\]  

(6)

The crystallite size of the Biofield Energy Treated zinc chloride at 20 equal to nearly 25.4º, 34.9º, 38.2º, 52.3º, 56.2º, 58.4º, and 61.7º (Table 1, entry 2, 4, 5, and 8-11) was significantly increased in the range of 25.04% to 166.82% compared with the control sample. Consequently, at 20 equal to 15.6º, 48.6º, and 91.9º (Table 1, entry 1, 6, and 13), the crystallite size of the Biofield Energy Treated zinc chloride was significantly decreased by 16.73%, 33.35%, and 19.95%, respectively compared with the control sample. However, the average crystallite size of the Biofield Energy Treated sample was significantly increased by 16.43% (Table 1, entry 14) compared to the control sample. The PXRD diffractograms of both the control and Biofield Energy Treated zinc chloride were significantly altered compared with the control sample. The PXRD diffractograms of both the control and Biofield Energy Treated zinc chloride were significantly altered compared with the control sample. The PXRD diffractograms of both the control and Biofield Energy Treated zinc chloride were significantly altered compared with the control sample.

### Table 1. PXRD data of the control and Biofield Energy Treated zinc chloride.

| Entry No. | Bragg angle (º20) | Relative Intensity (%) | FWHM (º20) | Crystallite size (G, nm) | % change* |
|-----------|-------------------|------------------------|------------|------------------------|-----------|
|           | Control | Treated | Control | Treated | Control | Treated | Control | Treated | Control | Treated | % change* |
| 1         | 15.56   | 15.60   | 39.59   | 41.02   | 0.0836  | 0.1004  | 53.14   | 44.25   | -16.73  |
| 2         | 25.37   | 25.43   | 30.40   | 31.09   | 0.1673  | 0.1338  | 26.97   | 33.73   | 25.05   |
| 3         | 29.29   | 29.21   | 29.26   | 41.66   | 0.0502  | 0.0502  | 90.64   | 90.63   | -0.02   |
| 4         | 34.90   | 34.88   | 91.00   | 38.44   | 0.0816  | 0.0502  | 56.56   | 91.93   | 62.54   |
| 5         | 38.22   | 38.21   | 15.20   | 20.55   | 0.2342  | 0.1338  | 19.90   | 34.83   | 75.03   |
| 6         | 48.55   | 48.60   | 100.00  | 100.00  | 0.0669  | 0.1004  | 72.21   | 48.13   | -33.35  |
| 7         | 49.12   | 49.19   | 71.85   | 72.97   | 0.0612  | 0.0612  | 79.12   | 79.14   | 0.03    |
| 8         | 52.18   | 52.27   | 12.22   | 13.29   | 0.1632  | 0.1224  | 30.05   | 40.08   | 33.38   |
| 9         | 56.09   | 56.16   | 21.75   | 46.38   | 10.30   | 0.0816  | 48.93   | 61.18   | 25.04   |
| 10        | 58.24   | 58.36   | 12.93   | 41.25   | 0.1632  | 0.0612  | 30.90   | 82.44   | 166.82  |
| 11        | 61.70   | 61.54   | 19.58   | 19.69   | 0.1020  | 0.0612  | 50.31   | 83.78   | 66.53   |
| 12        | 74.54   | 74.64   | 12.18   | 16.35   | 0.0816  | 0.0816  | 67.87   | 67.92   | 0.07    |
| 13        | 91.88   | 91.95   | 18.72   | 25.55   | 0.0816  | 0.1020  | 77.74   | 62.23   | -19.95  |
| 14        | Average crystallite size | 54.18 | 63.10 | 16.43 |

FWHM: Full width half maximum, *denotes the percentage change in the crystallite size of the Biofield Energy Treated sample with respect to the control sample.
The literature reported that the changes in the XRD patterns, such as crystallite size and relative intensities, indicated the modification of the morphology of the crystal as well as the proof of polymorphic transition [45-47]. As the crystal morphology of the Biofield Energy Treated sample was altered compared with the control sample, the treated sample might be a new polymorphic form of zinc chloride. The crystal pattern, size and even polymorphic form of a pharmaceutical play important roles in drug solubility, dissolution, and bioavailability. It has been reported in the literature that the alteration in crystal morphology has the significant impact on the in vitro rate of dissolution, which is related with the bioavailability of orally administered pharmaceutical/nutraceutical [41]. Thus, it can be concluded that the Biofield Energy Healing Treatment might be a very useful method for improving the bioavailability of zinc chloride.

3.2. Particle Size Distribution (PSD) Analysis

The particle size values and the surface area of the control and Biofield Energy Treated zinc chloride were investigated and the results are presented in Table 2. It was evident that the Biofield Energy Treatment has the ability to reduce the particle size of zinc chloride with respect to the control sample. The size of the particles in the Biofield Energy Treated sample at \(d_{10}\) was decreased by 2.42% while at \(d_{50}\), and \(d_{90}\) it was increased slightly by 0.43%, and 0.57%, respectively compared to the control sample.

| Parameter                  | \(d_{10}\) (µm) | \(d_{50}\) (µm) | \(d_{90}\) (µm) | Surface area (m²/g) |
|----------------------------|-----------------|-----------------|-----------------|---------------------|
| Control                    | 0.992           | 2.573           | 5.975           | 3.07                |
| Biofield Energy Treated    | 0.968           | 2.584           | 6.009           | 3.12                |
| Percent change (%)*        | -2.42           | 0.43            | 0.57            | 1.63                |

* denotes the percentage change in the particle size data (\(d_{10}\), \(d_{50}\), and \(d_{90}\)) and surface area of the Biofield Energy Treated sample with respect to the control sample.

The particle size and surface area have the direct effect on the dissolution of a compound in a solvent, because the surface energy influenced by the surface area and chemical affinity is the driving factor for dissolution efficiency [48, 49]. The surface area for both the control and Biofield Energy Treated zinc chloride samples were analyzed and the results are presented in Table 2. The surface area of the Biofield Energy Treated sample (3.12 m²/g) was increased by 1.63% compared with the control sample (3.07 m²/g).

Poorly crystallized compounds possess more surface area and higher exchange capacities than well-crystallized compounds [50]. In addition, the variation of the crystal morphology in the Biofield Energy Treated sample, which was well-supported from PXRD data, may cause to alter the surface area of the Biofield Energy Treated zinc chloride.
compared with the control sample. It has been well established that the particle size, shape and surface area of pharmaceutical compounds have an important impact on solubility, dissolution and in vivo bioavailability, as well as supports the designing of new drug delivery systems [51, 52]. Reducing the particle size and higher surface area would enhance the solubility of the solid particles, and consequently increase the dissolution rate and bioavailability [53]. Thus, it is assumed that the Biofield Energy Treated zinc chloride might be more soluble, absorbed at a faster rate and may possibly have more bioavailability than the untreated zinc chloride.

3.3. Fourier Transform Infrared (FT-IR) Spectroscopy

The FT-IR spectra of the control and Biofield Energy Treated samples of zinc chloride are presented in Figure 2. The characteristic peaks were observed at 3908, 3589, 3518, 1930, 1607, 980, and 511 cm⁻¹ in the control FT-IR spectrum (Figure 2). On the other hand, the FT-IR spectrum of the Biofield Energy Treated zinc chloride showed the notable absorption bands at 3902, 3589, 3519, 1931, 1607, 988, and 508 cm⁻¹ (Figure 2). The strong and broad absorption band centered near 3589 cm⁻¹ and the H-O-H bending motion at 1607 cm⁻¹ that were due to the presence of the lattice water was found in the FT-IR spectrum of both the control and Biofield Energy Treated samples (Figure 2). Literature suggested that the metal-halide stretching absorption band for inorganic materials generally found in the 750-100 cm⁻¹ region [54]. In control spectrum, metal-halogen (Zn-Cl) stretching was found at 511 cm⁻¹, whereas it was shifted downward in the Biofield Energy Treated sample at 508 cm⁻¹. Overall, FT-IR results suggested that there might be a significant impact of Biofield Energy Treatment on zinc chloride at the atomic level to decrease the force constant of Zn-Cl bonds. This result also supported with the PXRD data that Biofield Energy Treated sample might be the new polymorphic form of zinc chloride.

3.4. Ultraviolet-Visible Spectroscopy (UV-Vis) Analysis

The UV-visible spectra of both the control and Biofield Energy Treated zinc chloride are presented in Figure 3. The spectra of the control and treated sample showed the maximum absorbance (λ_max) at 196.4 nm and 196.2 nm, respectively, along with the miner shift of absorbance maxima from 1.9084 (control sample) to 1.9259 (Biofield Energy Treated sample). The UV absorbance occurs due to the diverse type of energy transitions from the singlet to the singlet excited state such as σ → σ', n → π', and π → π'. These type of electronic transitions occur when the difference in energy between the lowest unoccupied molecular orbital (LUMO) and the highest occupied molecular orbital (HOMO) is significantly higher than the activation energy of the compound [55]. The UV-vis spectroscopic analysis of zinc chloride displayed no change in the λ_max of the Biofield Energy Treated sample compared to the control sample. Thus, the structural configuration or activation energy of the Biofield Energy Treated sample was not changed compared with the control sample.
3.5. Differential Scanning Calorimetry (DSC) Analysis

The DSC thermograms of the control and Biofield Energy Treated zinc chloride are presented in Figure 4. The melting/decomposition temperature and enthalpy of fusion/decomposition of the control and treated zinc chloride are presented in Table 3. The melting temperature was slightly decreased by 0.20% in the Biofield Energy Treated zinc chloride (310.88°C) compared with the control sample (311.49°C). The onset and the endset melting temperature were also decreased slightly by 0.17% and 0.20%, respectively in the Biofield Energy Treated sample compared with the control sample. The latent heat of fusion or enthalpy of fusion ($\Delta H_{\text{fusion}}$) of the control and Biofield Energy Treated zinc chloride was 309.83 J/g and 402.09 J/g, respectively. The $\Delta H_{\text{fusion}}$ of the Biofield Energy Treated sample was significantly increased by 29.78% compared with the control sample. Similarly, the decomposition temperature of the Biofield Energy Treated zinc chloride (385.41°C) was increased by 0.45% compared to the control sample (383.67°C). The onset and endset decomposition temperature were also increased slightly by 0.59% and 0.23%, respectively in the Biofield Energy Treated sample compared with the control sample. The enthalpy of decomposition ($\Delta H_{\text{decomposition}}$) of the control and Biofield Energy Treated zinc chloride were 243.13 J/g and 626.37 J/g, respectively. The $\Delta H_{\text{decomposition}}$ of the Biofield Energy Treated sample was significantly decreased by 61.18% compared with the control sample. Overall, the results indicated that the Biofield Energy Treated zinc chloride needs more energy in the form of latent heat to undergo the process of melting after Biofield Energy Treatment. It is anticipated that Biofield Energy Treatment might enhance the internal energy in zinc chloride that leads to increase of the decomposition temperature. Thus, the thermal stability of the Biofield Energy Treated sample might be more compared with the control sample. The enhanced thermal stability of a drug is an advantage in the maintenance of the product in long term storage condition throughout the shelf-life for any pharmaceutical formulations [56].
Table 3. The latent heat of fusion (J/g), enthalpy of decomposition (J/g) and melting/decomposition temperature (°C) values of the control and Biofield Energy Treated zinc chloride.

| Endothermic peak | Description               | T\(_{onset}\) (°C) | T\(_{peak}\) (°C) | T\(_{endset}\) (°C) | ΔH (J/g) |
|------------------|---------------------------|---------------------|-------------------|---------------------|----------|
| Endothermic peak | Control sample            | 299.49              | 311.49            | 316.30              | 309.83   |
|                  | Biofield Energy Treated sample | 298.99              | 310.88            | 315.68              | 402.09   |
| % Change*        |                           | -0.17               | -0.20             | -0.20               | 29.78    |
| Exothermic peak  | Control sample            | 380.43              | 383.67            | 385.00              | 626.37   |
|                  | Biofield Energy Treated sample | 382.67              | 385.41            | 385.90              | 243.13   |
| % Change*        |                           | 0.59                | 0.45              | 0.23                | -61.18   |

T\(_{onset}\): Onset melting/decomposition temperature, T\(_{peak}\): Peak melting/decomposition temperature, T\(_{endset}\): Endset melting/decomposition temperature, ΔH: Enthalpy of fusion/decomposition, * denotes the percentage change of the Biofield Energy Treated sample with respect to the control sample.

Figure 4. DSC thermograms of the control and Biofield Energy Treated zinc chloride.

4. Conclusions

The current experimental results revealed that The Trivedi Effect® - Consciousness Energy Healing Treatment had the significant effects on the physical, structural, thermal, and behavioral properties of zinc chloride. The PXRD data displayed the significant alteration of the crystallite size and relative intensities of the PXRD peaks in The Trivedi Effect® treated sample compared with the control sample. The average crystallite size of the treated sample was significantly increased by 16.43% compared with the control sample. The surface area of the treated sample was increased by 1.63% compared with the control sample. The FT-IR spectroscopic analysis revealed that Zn-Cl stretching in the control sample was 511 cm\(^{-1}\), whereas it was significantly shifted downward to 508 cm\(^{-1}\) in the treated sample. The DSC analysis exhibited that the melting temperature was not altered significantly, while decomposition temperature was increased by 0.45% in the treated sample compared to the control sample. The latent heat of fusion of the treated sample was significantly increased by 29.78% compared with the control sample. Similarly, the enthalpy of decomposition of the treated sample was significantly altered by 61.18% compared with the control sample. Thus, the Biofield Energy Treatment improve the thermal stability of the treated sample compared to the control sample. Briefly, The Trivedi Effect®
- Consciousness Energy Healing Treatment might introduce a
new thermally stable polymorphic form of zinc chloride that
could be more soluble and bioavailable compared with the
untreated compound. Hence, Biofield Energy Treated zinc
chloride would be very useful to design better nutraceutical
and/or pharmaceutical formulations that might offer better
therapeutic response against immunological disorders,
inflammatory diseases, aging, stress, Wilson’s disease,
cancer, viral diseases, parakeratosis, anorexia, hypogeusia,
geophagia, dysosmia, hypogonadism, growth retardation, etc.

Abbreviations

DSC: Differential scanning calorimetry, FT-IR: Fourier
transform infrared spectroscopy, FWHM: Full width half
maximum, G: Crystallite size, HOMO: Highest energy occupied
molecular orbital, LUMO: Lowest energy unoccupied molecular
orbital, T onset: Onset melting/decomposition temperature, T peak:
Peak melting/decomposition temperature, T endset: Endset
melting/decomposition temperature, ΔH: Enthalpy of
fusion/decomposition, UV-vis: Ultraviolet-visible spectroscopy,
PSD: Particle size distribution, PXRD: Powder X-ray
diffraction.

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References

[1] Ronconi L, Sadler PJ (2008) Applications of heteronuclear
NMR spectroscopy in biological and medicinal inorganic
chemistry. Coordn Chem Rev 252: 2239-2277.
[2] Berg JM, Shi Y (1996) The galvanization of biology: A growing
appreciation for the roles of zinc. Science 271: 1081-1085.
[3] Higdon JV, Ho E (2005) In: M. Gielen, E. R. T. Tiekink
(Eds.), Metallotherapeutic drugs and metal-based diagnostic
agents: The use of metals in medicine, Wiley-VCH,
Weinheim, p. 237.
[4] Brewer GI (2001) Zinc acetate for the treatment of Wilson’s
disease. Expert Opin Pharmacother 2: 1473-1477.
[5] Prasad AS (1979) Clinical, biochemical, and pharmacological
role of zinc. Ann Rev Pharmacol Toxicol 19: 393-426.
[6] Supuran CT (2008) Carbonic anhydrases: Novel therapeutic
applications for inhibitors and activators. Nat Rev Drug Dis 7:
168-181.
[7] Elmes ME (1975) Letter: Zinc in human medicine. Lancet 2:
549.
[8] Mazumder PM, Pattanayak S, Parvani H, Sasmal D,
Rathinavelusamy P (2012) Evaluation of immunomodulatory
activity of Glycyrrhiza glabra L. roots in combination with
zing. Asian Pac J Trop Biomed 2: S15-S20.
[9] Brynestad J, Yakel HL (1978) Preparation and structure of
anhydrous zinc chloride. Inorg Chem 17: 1376-1377.
[10] Kasture AV, Wadodkar SG (2008) A text book of
pharmaceutical chemistry-1, Niral Prakashan, 25th Ed., Pune,
India.
[11] Mahadik KR, Kuchekar BS (2008) Concise inorganic
pharmaceutical chemistry, Niral Prakashan, 25th Ed., Pune,
India.
[12] McDaniel S, Goldman GD (2002) Consequences of using
escharotic agents as primary treatment for nonmelanoma skin
cancer. Arch Dermatol 138: 1593-1596.
[13] Hu J, Yang Z, Wang J, Yu J, Guo J, Liu S, Qian C, Song L,
Wu Y, Cheng J (2016) Zinc chloride transiently maintains
mouse embryonic stem cell pluripotency by activating Stat3
signaling. PLoS One 11: e0148994.
[14] Fukuyama Y, Kawarai S, Tezuka T, Kawabata A, Maruo T
(2016) The palliative efficacy of modified Mohs paste for
controlling canine and feline malignant skin wounds. Vet Q 1:
1-7.
[15] Yakimovskii AF, Kryzhanovskaya SY (2015) Zinc chloride
and zinc acetate injected into the neostriatum produce
opposite effect on locomotor behavior of rats. Bull Exp Biol
Med 160: 281-282.
[16] Stenger VJ (1999) Bioenergetic fields. Sci Rev Alternative
Med 3: 16-21.
[17] Rogers, M (1989) "Nursing: A Science of Unitary Human
Being." In J. P. Riehl-Sisca (ed.) Conceptual Models for
Nursing Practice. 3rd Edn. Norwark: Appleton & Lange.
[18] Rosa L, Rosa E, Sarner L, Barrett S (1998) A close look at
therapeutic touch. Journal of the American Medical
Association 279: 1005-1010.
[19] Warber SL, Cornelio D, Straughn, J, Kile G (2004) Biofield
energy healing from the inside. J Altern Complement Med 10:
1107-1113.
[20] Koithan M (2009) Introducing complementary and alternative
therapies. J Nurse Pract 5: 18-20.
[21] Trivedi MK, Patil S, Shettigar H, Mondal SC, Jana S (2015)
The potential impact of biofield treatment on human brain
tumor cells: A time-lapse video microscopy. J Integr Oncol 4:
141.
[22] Trivedi MK, Patil S, Shettigar H, Bairwa K, Jana S (2015)
Phenotypic and biotypic characterization of Klebsiella
oxytoca: An impact of biofield treatment. J Microb Biochem
Technol 7: 203-206.
[23] Trivedi MK, Patil S, Shettigar H, Gangwar M, Jana S (2015)
An effect of biofield treatment on multidrug-resistant
Burkholderia cepacia: A multihost pathogen. J Trop Dis 3:
167.
[24] Trivedi MK, Patil S, Shettigar H, Gangwar M, Jana S (2015)
An evaluation of biofield treatment on susceptibility pattern of
multidrug resistant Stenotrophomonas maltophilia: An
emerging global opportunistic pathogen. Clin Microbiol 4:
211.
[25] Trivedi MK, Patil S, Shettigar H, Gangwar M, Jana S (2015)
In vitro evaluation of biofield treatment on cancer biomarkers
involved in endometrial and prostate cancer cell lines. J
Cancer Sci Ther 7: 253-257.
[26] Trivedi MK, Branton A, Trivedi D, Nayak G, Mondal SC, Jana S (2015) Evaluation of plant growth regulator, immunity and DNA fingerprinting of biofield energy treated mustard seeds (Brassica juncea). Agriculture, Forestry and Fisheries. 4: 269-274.

[27] Trivedi MK, Branton A, Trivedi D, Nayak G, Mondal SC, Jana S (2015) Biochemical differentiation and molecular characterization of biofield treated Vibrio para-haemolyticus. American Journal of Clinical and Experimental Medicine 3: 260-267.

[28] Trivedi MK, Branton A, Trivedi D, Gangwar M, Jana S (2015) Antimicrobial susceptibility, biochemical characterization and molecular typing of biofield treated Klebsiella pneumoniae. J Health Med Inform 6: 206.

[29] Trivedi MK, Tallapragada RM, Branton A, Trivedi D, Nayak G, Latiyal O, Jana S (2015) Spectroscopic characterization of disulfiram and nicotinic acid after biofield treatment. J Anal Bioanal Tech 6: 265.

[30] Trivedi MK, Tallapragada RM, Branton A, Trivedi D, Nayak G, Latiyal O, Jana S (2015) Analysis of physical, thermal, and structural properties of biofield energy treated molybdenum dioxide. International Journal of Materials Science and Applications 4: 354-359.

[31] Trivedi MK, Branton A, Trivedi D, Nayak G, Bairwa K, Jana S (2015) Spectroscopic characterization of disulfiram and nicotinic acid after biofield treatment. J Anal Bioanal Tech 6: 265.

[32] Trivedi MK, Branton A, Trivedi D, Shettigar H, Bairwa K, Jana S (2015) Fourier transform infrared and ultraviolet-visible spectroscopic characterization of biofield treated salicylic acid and sparflxacin. Nat Prod Chem Res 3: 186.

[33] Trivedi MK, Tallapragada RM, Branton A, Trivedi D, Nayak G, Mishra RK, Jana S (2015) Biofield treatment: A potential strategy for modification of physical and thermal properties of gluten hydrolysate and ipomoea macroelements. J Nutr Food Sci 5: 414.

[34] Trivedi MK, Nayak G, Patil S, Tallapragada RM, Jana S, Mishra RK (2015) Bio-field Treatment: An effective strategy to improve the quality of beef extract and meat infusion powder. J Nutr Food Sci 5: 389.

[35] Trivedi MK, Branton A, Trivedi D, Nayak G, Latiyal O, Jana S (2015) Evaluation of biofield treatment on atomic and thermal properties of ethanol. Organic Chem Curr Res 4: 145.

[36] Trivedi MK, Branton A, Trivedi D, Nayak G, Singh R, Jana S (2015) Physical, thermal and spectroscopic studies on biofield treated p-dichlorobenzene. Biochem Anal Biochem 4: 204.

[37] Trivedi MK, Branton A, Trivedi D, Nayak G, Bairwa K, Jana S (2015) Physicochemical and spectroscopic characterization of biofield energy treated p-anisidine. Pharm Anal Chem Open Access 6: 102.

[38] Trivedi MK, Branton A, Trivedi D, Nayak G, Gangwar M, Jana S (2015) Agronomic characteristics, growth analysis, and yield response of biofield treated mustard, cowpea, horse gram, and groundnuts. International Journal of Genetcs and Genomics 3: 74-80.

[39] Trivedi MK, Branton A, Trivedi D, Nayak G, Gangwar M, Jana S (2015) Analysis of genetic diversity using simple sequence repeat (SSR) markers and growth regulator response in biofield treated cotton (Gossypium hirsutum L.). American Journal of Agriculture and Forestry 3: 216-221.

[40] Chereson R (2009) Bioavailability, bioequivalence, and drug selection. In: Makoid CM, Vuchetich PJ, Banakar UV (Eds) Basic Pharmacokinetics (1st Edn) Pharmaceutical Press, London.

[41] Blagden N, de Matas M, Gavan PT, York P (2007) Crystal engineering of active pharmaceutical ingredients to improve solubility and dissolution rates. Adv Drug Deliv Rev 59: 617-630.

[42] Trivedi MK, Mohan TRR (2016) Biofield energy signals, energy transmission and neutrinos. American Journal of Modern Physics 5: 172-176.

[43] Alexander L, Klug HP (1950) Determination of crystallite size with the X-Ray Spectrometer. J App Phys 21: 137.

[44] Langford JI, Wilson AJC (1978) Scherrer after sixty years: A survey and some new results in the determination of crystallite size. J Appl Cryst 11: 102-113.

[45] Raza K, Kumar P, Ratan S, Malik R, Arora S (2014) Polymorphism: The phenomenon affecting the performance of drugs. SOJ Pharm Pharm Sci 1: 10.

[46] Brittain HG (2009) Polymorphism in pharmaceutical solids in Drugs and Pharmaceutical Sciences, volume 192, 2nd Edn, Informa Healthcare USA, Inc., New York.

[47] Thiruvengadam E, Vellaisamy G (2014) Polymorphism in pharmaceutical ingredients a review. World Journal of Pharmacy and Pharmaceutical Sciences 3: 621-633.

[48] http://www.dissolution.com/ddg/showthread.php?2366-Surface-Area-vs-Particle-Size.

[49] Mosharrof M, Nyström C (1995) The effect of particle size and shape on the surface specific dissolution rate of microsized practically insoluble drugs. Int J Pharm 122: 35-47.

[50] Murray HH, Lyons SC (1960) Further correlation of kaolinite crystallinity with chemical and physical properties. Clays Clay Miner 8: 11-17.

[51] Sun J, Wang F, Sui Y, She Z, Zhai W, Wang C, Deng Y (2012) Effect of particle size on solubility, dissolution rate, and oral bioavailability: Evaluation using coenzyme Q10 as naked nanoparticles. Int J Nanomed 7: 5733-5744.

[52] Khadka P, Ro J, Kim H, Kim I, Kim JT, Kim H, Cho JM, Yun G, Lee J (2014) Pharmaceutical particle technologies: An approach to improve drug solubility, dissolution and bioavailability. Asian J Pharm Sci 9: 304-316.

[53] Buckton G, Beezer AE (1992) The relationship between particle size and solubility. Int J Pharmaceuticals 82: R7-R10.

[54] Stuart BH (2004) Infrared spectroscopy: Fundamentals and applications in Analytical Techniques in the Sciences. John Wiley & Sons Ltd., Chichester, UK.

[55] Hesse M, Meier H, Zeeh B (1997) Spectroscopic methods in organic chemistry, Georg Thieme Verlag Stuttgart, New York.

[56] Bajaj S, Singla D, Sahuja N (2012) Stability testing of pharmaceutical products. J App Pharm Sci 2: 129-138.