

# Powder XRD, PSD and DSC Analysis of the Consciousness Energy Healing Treated Zinc Chloride

**Dahryn Trivedi<sup>1</sup> and Snehasis Jana<sup>2\*</sup>**

<sup>1</sup>Trivedi Global, Inc., Henderson, USA

<sup>2</sup>Trivedi Science Research Laboratory Pvt. Ltd., Thane (W), India

**\*Corresponding author:** Snehasis Jana, Trivedi Science Research Laboratory Pvt. Ltd., Thane (W), Maharashtra, India, Email: publication@trivedieffect.com

## Research Article

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## Abstract

Zinc chloride is commonly used as a source of zinc for the treatment of many diseases and overall maintenance of good health. The impacts of the Trivedi Effect® on the physicochemical, thermal, and behavioral properties of zinc chloride were evaluated using sophisticated analytical techniques. Zinc chloride was divided into control and treated parts. Only, the treated part received the Trivedi Effect®-Consciousness Energy Healing Treatment remotely by a renowned Biofield Energy Healer, Dahryn Trivedi. The powder XRD relative peak intensities and crystallite sizes of the treated zinc chloride were significantly altered ranging from -58.73 to 141.43 and -74.03 to 228.56%, respectively compared with the control sample. The average crystallite size of the treated zinc chloride was significantly increased by 4.34% compared with the control sample. The particle sizes of the treated zinc chloride sample were significantly altered by 11.04% ( $d_{10}$ ), -11.85% ( $d_{50}$ ), -20.35% ( $d_{90}$ ), and -21.88% {D (4, 3)} compared with the control sample. Thus, the surface area of the treated zinc chloride (10400 m<sup>2</sup>/g) was significantly increased by 112.24% compared with the control sample (4900 m<sup>2</sup>/g). The latent heat of fusion and decomposition of the treated sample were significantly increased by 96.18% and 134.66%, respectively compared with the control sample. The current study predicted that the Trivedi Effect®-Consciousness Energy Healing Treatment might produce a new polymorphic form of zinc chloride with larger crystallite size, smaller particle size, and increased surface area, which would improve the solubility, absorption, bioavailability, and thermal stability compared with the control sample. Therefore, the Consciousness Energy Healing Treated zinc chloride would be very useful to design more efficacious nutraceutical or pharmaceutical formulations for the treatment of immunological disorders, inflammatory diseases, aging, stress, cancer, parakeratosis, dysosmia, hypogonadism, Wilson's disease, anorexia, etc.

**Keywords:** Consciousness Energy Healing Treatment; The Trivedi Effect®; Zinc Chloride; Powder XRD; Particle Size; Surface Area; Latent Heat

**Abbreviations:** PXRD: Powder X-ray Diffraction; PSD: Particle Size Distribution; DSC: Differential Scanning Calorimetry; CAM: Complementary and Alternative Medicine; NCCIH: National Center of Complementary and Integrative Health.

## Introduction

Zinc is of the essential trace element which regulates a broad spectrum of physiological functions in the human body [1]. Zinc is plenty available in animal meat, eggs, fish, fowl, milk, wheat, and various seeds like poppy, sesame, mustard, alfalfa, celery, nuts, beans, almonds, pumpkin seeds, sunflower seeds, whole grains, and blackcurrant [2,3]. It is available in more than 100 enzymes (i.e., carboxypeptidase, carbonic anhydrase, etc.) and protein (i.e., metallothioneins), coordinate amino acid chains, act like a structural ion in nucleic acid and protein metabolism, transcription factors, etc [4-7]. It enhances fertility, protects the retina, modulates immune, antioxidant, and assumed antiviral in the body [6,8]. It increases the leukocyte count and phagocytic index in combination with other nutraceuticals [9]. It is also used to prevent many deficiency disorders include hypogeusia, dysosmia, anorexia, parakeratosis, geophagia, hypogonadism, growth retardation, Wilson's disease, etc [10-13]. Deficiency of zinc is due to inadequate dietary intake, malabsorption, chronic renal and liver disease, sickle cell disease, acrodermatitis enteropathica, diabetes, malignancy and, etc [14].

Zinc chloride is a very common source for zinc, used in the nutraceutical, pharmaceutical, and cosmetic industry for the preparation of the drug, diagnostic agent, desensitizer, mouth-wash, dentin disinfectant, deodorant, protein precipitator and insulin preparation [15-18]. It is also used for the treatment of skin cancer and canine and malignant skin wounds [19,20]. Therefore, it was considered as one of the ingredients in the nutraceuticals/pharmaceuticals supplement for the prevention and treatment of various disorders. It is also used in the chemicals, textile, metallurgy, and paper manufacturing industry [17]. Zinc chloride is irritant to skin, occasionally leading to hematemesis, caustic to the gastrointestinal tract, lethal at the dose of 3-5 mg to human, and very harmful to the pulmonary and lungs on exposure to zinc chloride smoke [17,21].

Physicochemical properties of nutraceutical and pharmaceutical compounds are very important for better bioavailability and therapeutic efficacy. Physicochemical properties of many pharmaceutical/nutraceutical

compounds reported being significantly altered by means of the Trivedi Effect®-Consciousness Energy Healing Treatment, along with enhanced the bioavailability of poorly bioavailable pharmaceutical/ nutraceutical compounds [22-27]. The Trivedi Effect® is a scientifically proven phenomenon in which an individual can harness this intelligent energy from the universe and transfer it anywhere on the planet *via* the possible mediation of neutrinos [28-30]. The Biofield is infinite, paradigmatic and dynamic electromagnetic field exists surrounding the human body [31,32]. Biofield based Energy Healing Therapies accepted worldwide for the use against various human disease conditions and has been accepted as a Complementary and Alternative Medicine (CAM) health care approach by the National Center of Complementary and Integrative Health (NCCIH) along with Tai Chi, Reiki, hypnotherapy, Ayurvedic medicine, yoga, Qi Gong, aromatherapy, meditation, traditional Chinese herbs and medicines, homeopathy, chiropractic/osteopathic manipulation, acupuncture, acupressure, naturopathy, cranial sacral therapy, movement therapy, etc [31-33]. Biofield Energy Treatment has also been reported in many peer-reviewed scientific journals with significant outcomes in microbiology, biotechnology, medical research, and agricultural science [34-42]. The physicochemical properties of a drug have a vital role in the drug during processing, formulation, packaging, and storage [43,44]. In this study, the influence of the Trivedi Effect® on the properties of zinc chloride was evaluated using sophisticated analytical techniques.

## Materials and Methods

### Chemicals and Reagents

The test sample zinc chloride powder was procured from Tokyo Chemical Industry Co., Ltd., Japan and the additional chemicals were purchased in India.

### Consciousness Energy Healing Treatment Strategies

The test sample zinc chloride was equally divided into two parts. One part of the zinc chloride did not receive the Trivedi Effect®-Consciousness Energy Healing Treatment and named as the control zinc chloride sample. But, the control zinc chloride was treated with a "sham" healer, who did not have any knowledge about the Consciousness Energy Healing Treatment. The other part of the zinc chloride was treated with the Consciousness Energy Healing Treatment by a renowned Biofield Energy Healer, Dahryn Trivedi, USA remotely under standard laboratory

conditions (3 minutes) and named as treated zinc chloride. After that, the treatment both the samples were kept in similar sealed conditions and further characterized using different analytical techniques.

### Characterization

The powder X-ray diffraction (PXRD) analysis of zinc chloride powder samples was performed with the help of PANalytical X'Pert3 powder X-ray diffractometer, UK [45,46]. The average size of crystallites was calculated using the Scherrer's formula (1)

$$G = k\lambda/\beta\cos\theta \quad (1)$$

Where, G: crystallite size,  $\lambda$ : radiation wavelength, k: equipment constant,  $\beta$ : full-width half maximum, and  $\theta$ : Bragg angle [47].

The particle size distribution (PSD) analysis of the zinc chloride was performed using Malvern Mastersizer 3000, UK using the wet method. Similarly, the differential scanning calorimetry (DSC) analysis of zinc chloride was performed with the help of DSC Q200, TA instruments [45,46].

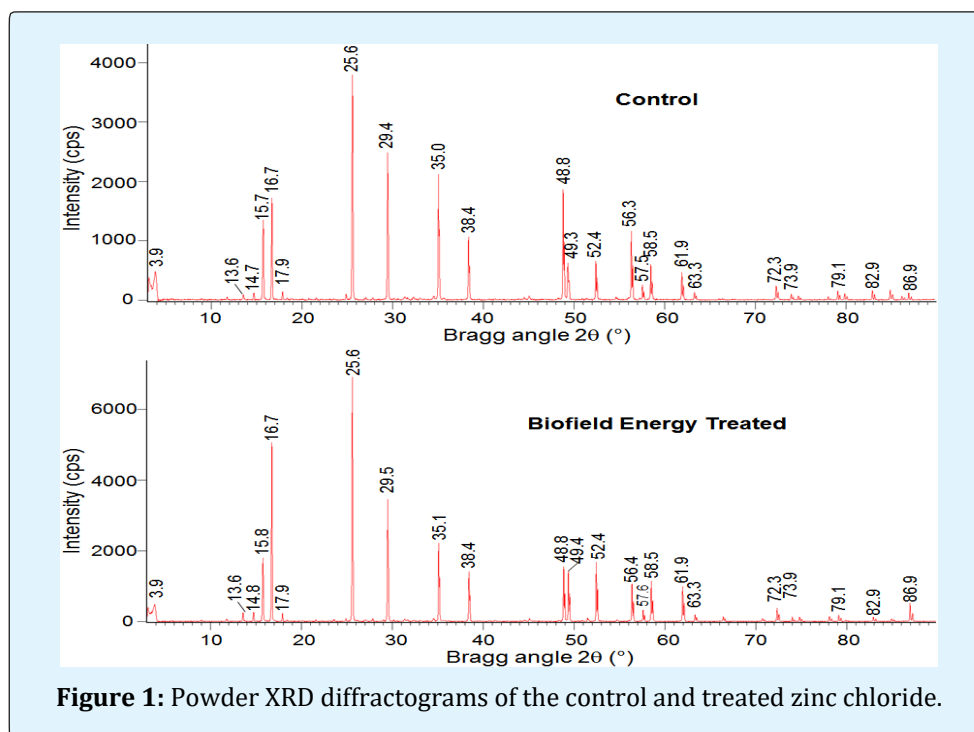
The % change in the parameters in the treated zinc chloride was calculated compared to the control sample using the following equation 2:

$$\% \text{ Change} = \frac{[\text{Treated}-\text{Control}]}{\text{Control}} \times 100 \quad (2)$$

## Results and Discussion

### Powder X-ray Diffraction (PXRD) Analysis

The PXRD diffractograms of both the zinc chloride are shown in Figure 1. The samples displayed sharp and intense peaks in their respective diffractograms indicated that both the samples were crystalline nature. Both the PXRD diffractograms showed greater intensity (100%) at Bragg's angle ( $2\theta$ ) equal to  $25.6^\circ$  (Table 1, entry 9). The relative PXRD peak intensities of the treated zinc chloride were significantly altered in the range from -58.73 to 141.43 compared with the control sample (Table 1). Therefore, the crystallite sizes of the Biofield Energy Treated zinc chloride were significantly altered in the range from -74.03 to 228.56% compared to the control sample. But, the average crystallite size of the treated zinc chloride was increased by 4.34% (Table 1, entry 40) compared to the control sample.



**Figure 1:** Powder XRD diffractograms of the control and treated zinc chloride.

Entry No.	Bragg angle ( $^{\circ}2\theta$ )	Relative Intensity (%)			Crystallite Size(G, nm)		
		Control	Treated	% Change	Control	Treated	% Change
1	3.9	12.47	7.17	-42.5	21.56	17.26	-19.98
3	13.6	2.38	3.74	57.14	34.74	49.7	43.09
4	14.8	3.17	3.83	20.82	38.65	43.54	12.65
5	15.8	35.87	26.74	-25.45	43.54	49.82	14.44
6	16.7	46.33	75.72	63.44	38.74	43.66	12.7
7	17.9	3.47	3.29	-5.19	34.92	44.16	26.48
8	24.9	2.51	1.14	-54.58	35.32	50.55	43.11
9	25.6	100	100	0	50.55	58.49	15.71
10	29.5	65.7	51.43	-21.72	71.27	18.51	-74.03
11	34.6	1.69	1.12	-33.73	22.57	74.15	228.56
12	35.1	56.4	33.18	-41.17	74.14	98.9	33.39
13	35.2	30.26	17.62	-41.77	98.88	59.9	-39.43
14	38.4	28.4	20.96	-26.2	59.89	99.86	66.76
15	38.5	14.55	10.53	-27.63	74.88	62.12	-17.05
16	48.8	49.77	23.16	-53.47	62.11	62.15	0.07
17	48.9	26.09	11.73	-55.04	62.14	62.25	0.18
18	49.4	16.55	21.39	29.24	44.45	52.54	18.2
19	52.4	17.52	25.25	44.12	63.04	63.09	0.08
20	52.6	9.89	13.52	36.7	63.08	64.17	1.73
21	56.4	30.94	16.05	-48.13	53.46	64.22	20.11
22	56.5	15.36	8.63	-43.82	53.5	64.54	20.63
23	57.6	6.63	4.77	-28.05	53.77	64.59	20.12
24	57.7	3.52	2.57	-26.99	64.58	54.02	-16.35
25	58.5	15.92	17.07	7.22	64.81	54.06	-16.58
26	58.6	8.06	8.9	10.42	64.87	54.97	-15.26
27	61.9	12.33	14.86	20.52	47.1	47.16	0.12
28	62.1	6.45	7.76	20.31	55.01	47.45	-13.73
29	63.3	3.43	2.81	-18.08	55.36	58.38	5.46
30	72.3	6.32	5.63	-10.92	50.03	50.1	0.15
31	72.5	3.69	2.9	-21.41	58.44	59.01	0.98
32	73.9	2.61	1.97	-24.52	59	59.32	0.56
33	74.8	1.61	1.79	11.18	44.48	60.68	36.41
34	78.1	1.47	2.05	39.46	60.66	52.39	-13.64
35	79.1	4.15	2.85	-31.33	61.12	45.93	-24.86
36	79.3	2.11	1.32	-37.44	45.92	62.89	36.95
37	82.9	4.4	1.82	-58.64	62.88	47.26	-24.84
38	83.4	2.52	1.04	-58.73	47.25	77.85	64.75
39	86.9	3.21	7.75	141.43	77.91	65.09	-16.46
40	Average crystallite size				54.59	56.97	4.34

**Table 1:** Powder XRD data of the control and treated zinc chloride.

It can be assumed from the results that the relative peak intensities and crystal sizes were significantly altered due to the Trivedi Effect<sup>®</sup>-Consciousness Energy Healing Treatment. As per the literature, any changes in the PXRD patterns, such as relative intensities and crystallite size, indicated the change in the crystal morphology as well as the proof of polymorphic transition

[48-50]. The crystal pattern, size, and even polymorphic form play important roles in drug solubility, dissolution, and bioavailability of orally administered pharmaceutical/nutraceutical [43]. Therefore, the Trivedi Effect<sup>®</sup>-Consciousness Energy Healing Treated zinc chloride could be very useful for designing more effective nutraceutical or pharmaceutical formulations.

### Particle Size Distribution (PSD) Analysis

The particle size values and the average surface area of both the zinc chloride samples were evaluated (Table 2). The particle sizes of the Biofield Energy Treated zinc chloride sample were significantly altered by 11.04%

( $d_{10}$ ), -11.85% ( $d_{50}$ ), -20.35% ( $d_{90}$ ), and -21.88% {D (4, 3)} compared with the control sample. The surface area of the treated zinc chloride (10400  $m^2/g$ ) was significantly increased by 112.24% compared with the control zinc chloride sample (4900  $m^2/g$ ).

Parameter	$d_{10}$ ( $\mu m$ )	$d_{50}$ ( $\mu m$ )	$d_{90}$ ( $\mu m$ )	D (4, 3) ( $\mu m$ )	Surface area ( $m^2/g$ )
Control	36.24	96.73	191.01	114.69	4900
Biofield Energy Treated	40.24	85.27	152.13	89.6	10400
Percent change (%)	11.04	-11.85	-20.35	-21.88	112.24

$d_{10}$ ,  $d_{50}$ , and  $d_{90}$ : particle diameter corresponding to 10%, 50%, and 90% of the cumulative distribution, D(4,3): the average mass-volume diameter, and SSA: the specific surface area.

**Table 2:** Particle size data and surface area of the control and treated samples.

As per the literature reports, the reduced particle size and increased surface area of any pharmaceutical compound improve its dissolution rate, absorption, and bioavailability [43,44,51]. From the results, it can be assumed that the introduction of the external force like the Trivedi Effect®-Biofield Energy Treatment transformed the larger size zinc chloride particles into smaller particles. Therefore, Biofield Energy Healing Treated zinc chloride might offer better solubility, absorption, and bioavailability in the body compared to the control sample.

### Differential Scanning Calorimetry (DSC) Analysis

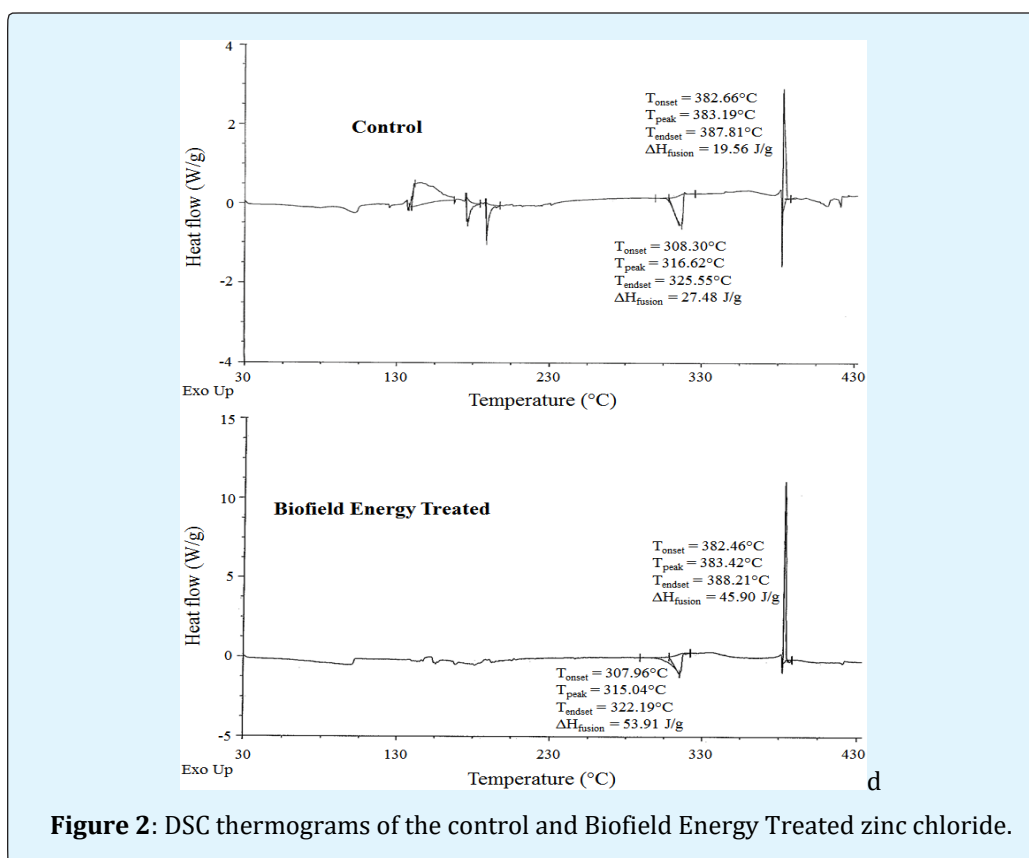
The DSC thermograms of both the control and Biofield Energy Treated zinc chloride are shown in Figure 2. The thermal analysis data such as melting/decomposition temperature and enthalpy of fusion/decomposition of the control and Biofield Energy Treated zinc chloride were calculated (Table 3). The melting temperature of the Biofield Energy Treated zinc chloride (315.04°C) was very

close compared with the control sample (316.62°C). Similarly, the decomposition temperature of the treated zinc chloride was similar to 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 27.48 J/g and 53.91 J/g, respectively. Therefore, the  $\Delta H_{\text{fusion}}$  of the Biofield Energy Treated sample was significantly increased by 96.18% compared with the control sample. Similarly, the enthalpy of decomposition ( $\Delta H_{\text{decomposition}}$ ) of the control and Biofield Energy Treated zinc chloride was 19.56 J/g and 45.90 J/g, respectively. The  $\Delta H_{\text{decomposition}}$  of the Biofield Energy Treated sample was significantly increased by 134.66% compared with the control sample. Overall, the thermal stability of the Biofield Energy Treated zinc chloride was significantly increased and needs more energy to undergo the process of melting after the Trivedi Effect®-Biofield Energy Treatment. The thermal stability of the pharmaceuticals and nutraceuticals are very important [52]. Therefore, improved thermal properties will be helpful for long-term storage stability of the treated zinc chloride.

Peak	Sample	T (°C)	$\Delta H$ (J/g)
Endothermic peak	Control sample	316.62	27.48
	Biofield Energy Treated sample	315.04	53.91
	% Change	-0.5	96.18
Exothermic peak	Control sample	383.19	19.56
	Biofield Energy Treated sample	383.42	45.9
	% Change	0.06	134.66

T: melting/decomposition temperature,  $\Delta H$ : Enthalpy of fusion/decomposition.

**Table 3:** The latent heat of fusion (J/g), enthalpy of decomposition (J/g) and melting/decomposition temperature (°C) values of the control and treated zinc chloride.



**Figure 2:** DSC thermograms of the control and Biofield Energy Treated zinc chloride.

## Conclusion

The current study results revealed that the Trivedi Effect®-Consciousness Energy Healing Treatment has a significant influence on the physicochemical properties of zinc chloride. The powder XRD peak intensities and crystallite sizes of the treated zinc chloride were significantly altered ranging from -58.73 to 141.43 and -74.03 to 228.56%, respectively compared with the control sample. However, the average crystallite size of the treated sample was significantly increased by 4.34% compared with the control sample. The particle sizes of the Biofield Energy Treated zinc chloride sample were significantly altered by 11.04% ( $d_{10}$ ), -11.85% ( $d_{50}$ ), -20.35% ( $d_{90}$ ), and -21.88%  $\{D(4, 3)\}$  compared with the control sample. Thus, the surface area of the treated zinc chloride was considerably increased by 112.24% compared with the control sample. The latent heat of fusion and decomposition of the Biofield Energy Treated sample were significantly increased by 96.18% and 134.66%, respectively compared with the control sample. The current study predicted that the Trivedi Effect®-Consciousness Energy Healing Treatment might produce a new polymorphic form of zinc chloride with larger

crystallite size, smaller particle size, and increased surface area, which would improve the solubility, absorption, bioavailability, and thermal stability compared with the control sample. Therefore, the Consciousness Energy Healing Treated zinc chloride would be very useful to design novel and more efficacious nutraceutical or pharmaceutical formulations for the better therapeutic response against immunological disorders, inflammatory diseases, aging, stress, cancer, parakeratosis, hypogeusia, dysosmia, hypogonadism, Wilson's disease, anorexia, etc.

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