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Physicochemical and Thermal Characterization of Consciousness Energy Healing Treated Copper (II) Chloride Using PXRD, DSC, and TGA/DTG

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Research Article

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Abstract

Copper chloride is a source of copper ion. Copper which is an essential trace element used for the treatment of cancer, inflammation, hematological, neurological disorder, etc. The impact of the Trivedi Effect®-Consciousness Energy Healing Treatment on the physicochemical and thermal properties of copper chloride was evaluated using sophisticated analytical techniques. The test sample copper chloride was divided into control and treated parts. Only the treated part received the Trivedi Effect®-Biofield Energy Healing Treatment remotely by a renowned Biofield Energy Healer, Dahryn Trivedi. The powder X-ray diffraction relative peak intensities of the treated sample were significantly altered from -84.64% to 108.82% compared with the control sample. Similarly, the crystallite sizes of the treated sample were significantly altered from -33.34% to 42.89%, but the overall crystallite size was decreased by 3.76% compared to the control sample. The evaporation, melting and decomposition temperatures of the treated copper chloride were significantly increased by 12.24%, 3.44%, and 2.86%, respectively compared to the control sample. Similarly, the latent heat of the evaporation, melting and decomposition of the treated sample was significantly altered by 46.38%, -26.34%, and 65.08% compared with the control sample. The overall weight loss in the treated sample was decreased by 1.32% compared to the control sample. Whereas, the maximum thermal degradation temperature values in the 1st, 2nd, and 3rd peaks of the Biofield Treated sample was decreased by 11.65%, 3.38%, and 2.04%, respectively compared with the control sample. After the Consciousness Energy Healing Treatment polymorphic form of copper chloride might have altered. The new form of copper chloride would be thermally more stable during manufacturing, delivery or storage conditions compared to the control sample. Hence, Biofield Energy Treated copper chloride would be advantageous to design better and more efficacious nutraceutical and pharmaceutical formulations that may provide a better therapeutic response against cancer, inflammation, wound healing, etc.

Keywords: Copper Chloride; The Trivedi Effect®; Consciousness Energy Healing Treatment; PXRD; DSC; TGA/DTG

Introduction

Copper is an essential trace element in the plants and animals. Copper is absorbed in the gut and found in the human body at a level of 1.4 to 2.1 mg/kg of body weight [1,2]. Copper exists in the human body mostly in bound form with the proteins, *i.e.* transport proteins, storage proteins or metalloenzymes. Copper proteins have various roles in biological electron transport and oxygen transportation processes, that exploit the easy Cu(I) and Cu(II) interconversion [1-3]. Copper (II) chloride ($CuCl_2$) is an inorganic compound and naturally found as both the anhydrous (tolbachite) and dihydrate (erichalcite) forms. The anhydrous copper chloride (light brown) absorbs moisture to form blue-green dihydrate [1,4,5]. Copper chloride is widely used as a catalyst in various organic reactions, i.e. Wacker process, organic synthesis, production of chlorine, etc. and also used as agricultural chemical, plating agent, surface treating agent, and processing aid [1-6]. Copper complexes can be used as an antitumor, anti-inflammatory and wound healing agent [4,7]. Copper chloride is used as a source of copper ion in copper deficiency disorder, *i.e.* hematological and neurological disorder.

Biofield referred as a quantum of energy matrix that is found surrounding the human body generated from the continuous movement of the charged particles (ions, cells, etc.) inside the body and the electromagnetic waves discharge in the form of biophotons. Biofield Energy Healing practitioners have the ability to acquire the energy from the "Universe" and can transfer into any living or nonliving object(s). The process by which the object(s) receive the Biofield Energy and respond in a useful way is called as Biofield Energy Healing Treatment [8,9]. Biofield Energy Therapy has been recognized as a Complementary and Alternative Medicine (CAM) health care approach by the National Center of Complementary and Integrative Health (NCCIH) with other therapies, medicines and practices such as acupressure, acupuncture, yoga, Qi Gong, Tai Chi, meditation, homeopathy, Reiki, healing touch, hypnotherapy, chiropractic/osteopathic manipulation, movement therapy, naturopathy, Ayurvedic medicine, traditional Chinese herbs and medicines, aromatherapy, cranial sacral therapy, etc [10,11]. The Trivedi Effect®-Consciousness Energy Healing Treatment (Biofield Energy Healing Treatment) is scientifically gained importance in several fields include material science [12,13], organic compounds [14,15], pharmaceuticals [16-18], nutraceuticals [19,20], biotechnology [21,22], genetics [23,24], medical science [25], microbiology [26,27], and agriculture [28,29], due to its amazing ability to alter the characteristic properties of the numerous non-living and living substances. It can be assumed that Biofield Energy Treated pharmaceutical/nutraceutical compounds would be beneficial for the enhancement of their therapeutic efficacy against various disease. The physicochemical and thermal properties of a pharmaceutical solid compound play an important role in bioavailability, therapeutic efficacy, and toxicity [30,31]. The Consciousness Energy Healing Treatment might change the physicochemical and thermal properties through the possible intervention of neutrinos [32]. Therefore, the experiment was designed to investigate the impact of the Trivedi Effect® on the physicochemical and thermal properties of copper chloride using modern analytical techniques.

Materials and Methods

Chemicals and Reagents

The test sample copper (II) chloride (≥ 98%) was purchased from VETEC, Sigma-Aldrich, India. Similarly, the other chemicals used in the experiments were purchased in India.

Consciousness Energy Healing Treatment Strategies

The test sample copper chloride was divided into control and treated parts. The control copper chloride sample did not receive the Trivedi Effect®-Consciousness Energy Healing Treatment. But, the control copper chloride was treated with a "sham" healer who did not have any knowledge about the Biofield Energy Treatment. The treated part of copper chloride was received the Consciousness Energy Healing Treatment remotely for 3 minutes under the standard laboratory conditions by the renowned Biofield Energy Healer, Dahryn Trivedi. After all the treatment, both the samples were kept in sealed conditions and characterized using different techniques.

Characterization

The powder X-ray diffraction (PXRD) analysis of copper chloride powder samples was performed with the

help of PANalytical X'Pert3 powder X-ray diffractometer, UK [11,17,20]. 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, λ: radiation wavelength, k: equipment constant, β: full-width half maximum, and θ: Bragg angle [33].

Similarly, the differential scanning calorimetry (DSC) analysis of copper chloride was performed with the help of DSC Q200, TA instruments. The thermal gravimetric analysis (TGA) thermograms of copper chloride samples were obtained with the help of TGA Q50 TA instruments [11,17,20].

The % change in the parameters in the treated copper 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 samples of copper chloride exhibited sharp and intense peaks (Figure 1) indicating that both the samples were crystalline. The diffractograms of both the copper chloride samples showed the highest peak intensity at Bragg's angle (2θ) equal to 16.3° (Table 1, entry 1).

The PXRD relative peak intensities of the Biofield Energy Treated sample were significantly altered from -84.64% to 108.82% compared with the control sample (Table 1, entry 1-12). Similarly, the crystallite sizes of the treated sample were significantly altered from -33.34% to 42.89% compared with the control sample (Table 1, entry 1-12). The average crystallite size was decreased by 3.76% in the treated sample (52.93 nm) compared to the control sample (55.00 nm).

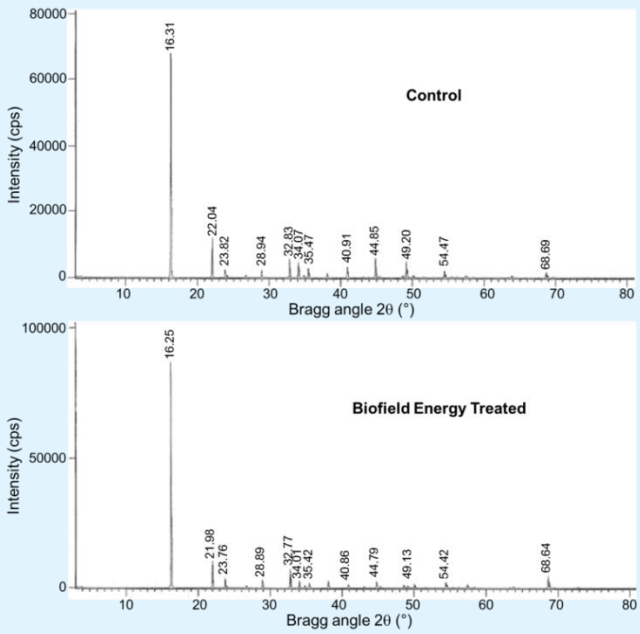

Figure 1: PXRD diffractograms of the control and treated copper chloride.

The changes in the crystallite size and relative peak intensities indicated that the crystal morphology of the treated copper chloride was altered compared to the control sample. Alteration in the crystallite size and relative peak intensities indicates the new polymorphs of the compound [11,17,20,34]. Polymorphic forms of pharmaceuticals have a significant impact on drug performance [35,36]. Therefore, it can be anticipated that the treatment could be a very useful method for the production of novel crystal polymorph of copper chloride that would provide an improved in its therapeutic performance.

Entry No.	Bragg angle (°2θ)	Relative Intensity (%)			Crystallite size (G, nm)		
		Control	Treated	% Change	Control	Treated	% Change
1	16.3	100.00	100.00	0.00	49.68	43.46	-12.52
2	22.0	16.95	11.71	-30.91	38.96	38.96	-0.01
3	23.8	3.60	3.98	10.56	50.26	50.26	-0.01
4	28.9	3.30	3.42	3.64	35.55	50.79	42.89
5	32.8	8.41	8.33	-0.95	58.84	58.83	-0.02
6	34.1	6.93	3.23	-53.39	59.03	49.18	-16.68
7	35.5	4.21	2.15	-48.93	74.07	49.37	-33.34
8	40.9	4.84	1.57	-67.56	60.25	60.24	-0.02
9	44.9	8.80	2.84	-67.73	61.07	61.06	-0.02
10	49.2	7.29	1.12	-84.64	51.74	51.73	-0.03
11	54.5	3.07	2.68	-12.70	63.50	52.91	-16.69
12	68.7	2.72	5.68	108.82	57.01	68.40	19.96

Table 1: PXRD data for the control and treated copper chloride.

Differential Scanning Calorimetry (DSC) Analysis

The DSC thermograms of both the sample of copper chloride exhibited two broad endothermic peaks and one sharp exothermic peak (Figure 2). According to the literature, the DSC curve of copper (II) chloride dihydrate shows a broad endothermic peak at 129.13 °C is due to the melting point of copper chloride [37].

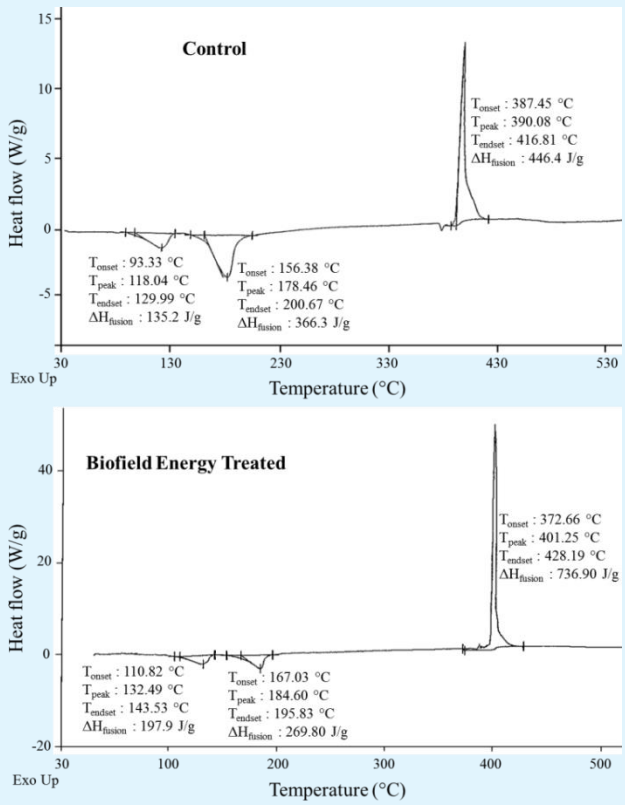

Figure 2: DSC thermograms of the control and treated copper chloride.

After the Biofield Energy Treatment, the melting point of the Biofield Energy Treated copper chloride was significantly increased by 12.24% compared to the control sample (Table 3). The latent heat of fusion (ΔH) of the Biofield Energy Treated copper chloride was significantly increased by 46.38% compared to the control sample. Thus, Biofield Energy Treated copper chloride required more energy in the form of ΔH to undergo the whole process of melting after Dahryn's Biofield Energy Treatment.

Sample	Melting /Decomposition Temperature (°C)			ΔH (J/g)		
	1st Peak	2nd Peak	3rd Peak	1st Peak	2nd Peak	3rd Peak
Control Sample	118.04	178.46	390.08	135.20	366.30	446.40
Biofield Energy Treated	132.49	184.60	401.25	197.90	269.80	736.90
%Change	12.24	3.44	2.86	46.38	-26.34	65.08

Table 2: DSC data for both control and treated samples of copper chloride
ΔH: Latent heat of fusion/ decomposition.

Subsequently, the 2nd broad endothermic peak was observed in the control sample that might be due to the melting temperature of copper chloride monohydrate produced from the dihydrate during the thermal reaction. The 2nd melting temperature of the treated sample was increased by 3.44% with a significant decline of ΔH by 26.34% compared to the control sample. Copper (II) chloride dihydrate decomposes at above 300 °C and releases chlorine gas [38]. Thus, a sharp exothermic peak at 390.08 and 401.25 °C were observed in the control and Biofield Energy Treated samples, respectively. It might be the decomposition of the copper chloride sample. The decomposition temperature and ΔH of the Biofield Energy Treated copper chloride were increased by 2.86% and 68.08% compared with the control sample (Table 2). The DSC results suggested that the thermal stability of the Biofield Energy Treated sample was significantly improved compared with the control sample.

Thermal Gravimetric Analysis (TGA) / Differential Thermogravimetric Analysis (DTG)

The TGA thermograms of the control and Biofield Energy Treated copper chloride showed three steps of thermal degradation (Figure 3).

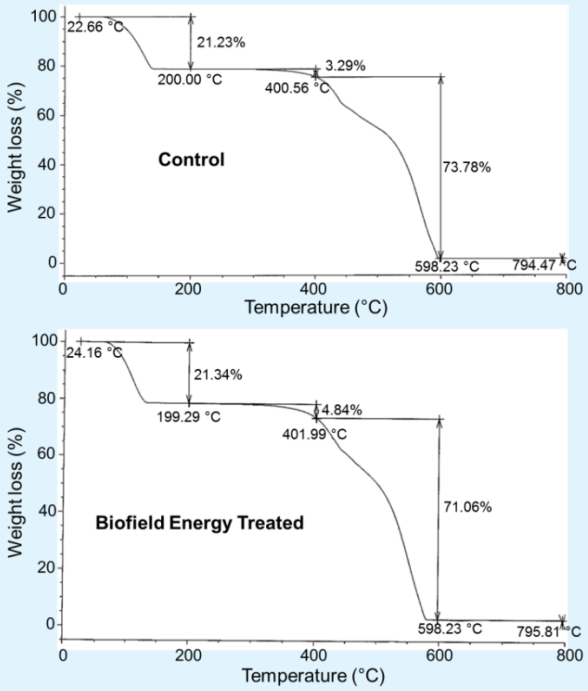

Figure 3: TGA thermograms of the control and treated copper chloride.

Mohamed and Halawy reported that the copper chloride dihydrate loses its two water molecules in one step from the temperature 66 to 132°C. As per the literature, copper chloride dihydrate exhibited a weight loss of 21.40% and maximum thermal degradation temperatures (T_{max}) of 108.6°C at 10°C/min heating rate under a dynamic nitrogen atmosphere [37]. The total weight loss of the control and Biofield Energy Treated samples were 98.30% and 97.24%, respectively. The overall weight loss of the Biofield Energy Treated copper chloride was decreased by 1.08% compared with the control sample (Table 3). The 1st step degradation was due to the evaporation of water molecule in the Biofield Energy Treated and the control samples. The 2nd and 3rd step of degradations observed in both control and Biofield Treated samples might be due to the dehydration of water molecule from copper chloride monohydrate and decomposition of copper chloride, respectively.

Sample	TGA Weight loss (%)				DTG T_{max} (°C)		
	1st step	2nd step	3rd step	Total	1st step	2nd step	3rd step
Control Sample	21.23	3.29	73.78	98.30	124.25	435.63	566.9
Biofield Energy Treated Sample	21.34	4.84	71.06	97.24	109.78	420.92	555.34
% Change	0.52	47.11	-3.69	-1.08	-11.65	-3.38	-2.04

Table 3: TGA/DTG data of the control and treated samples of copper chloride

T_{max}: the maximum thermal degradation temperatures at which weight loss takes place in DTG.

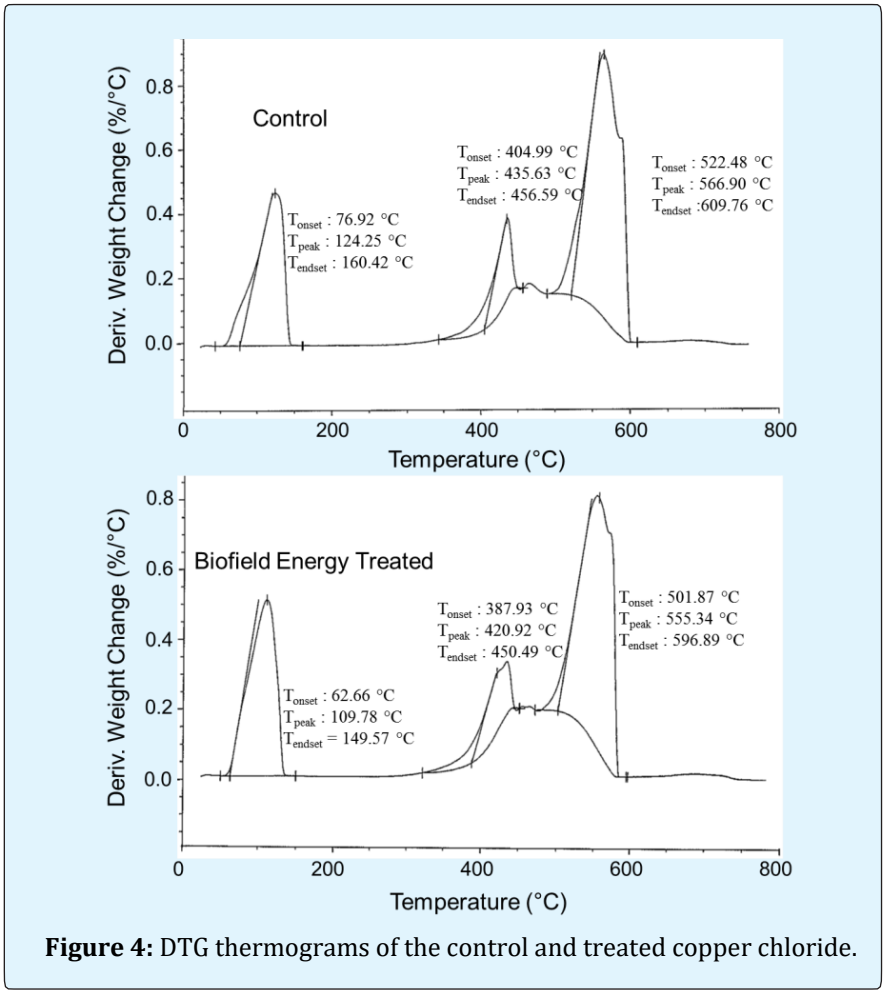

Figure 4: DTG thermograms of the control and treated copper chloride.

The DTG thermograms of the control and treated samples (Figure 4) exhibited three peaks. The T_{max} values in the 1st, 2nd, and 3rd peaks of the treated sample were decreased by 11.65%, 3.38%, and 2.04% compared with the control sample (Table 3). Overall, TGA/DTG data revealed that the thermal stability of the Biofield Energy Treated copper chloride was altered compared to the control sample.

Conclusions

The current study confirmed that the Trivedi Effect®-Consciousness Energy Healing Treatment has a significant effect on the relative peak intensities, crystallite size, and thermal stability of copper chloride. The powder X-ray diffraction relative peak intensities of the Biofield Energy Treated copper chloride were significantly altered from -84.64% to 108.82% compared with the control sample. Similarly, the crystallite sizes of the Biofield Energy Treated copper chloride were significantly altered from -33.34% to 42.89%, but the overall crystallite size was decreased by 3.76% compared to the control sample. The evaporation, melting and decomposition temperatures of the Biofield Energy Treated copper chloride were significantly increased by 12.24%, 3.44%, and 2.86%, respectively compared to the control sample. Similarly, the latent heat of the evaporation, melting and decomposition of the Biofield Energy Treated copper chloride was significantly altered by 46.38%, -26.34%, and 65.08% compared with the control sample. The total weight loss in the Biofield Energy Treated copper chloride was decreased by 1.32% compared to the control sample. Whereas, the T_{max} values in the 1st, 2nd, and 3rd peaks of the Biofield Energy Treated copper chloride was decreased by 11.65%, 3.38%, and 2.04%, respectively compared with the control sample. After the Trivedi Effect®-Consciousness Energy Healing Treatment polymorphic form of copper chloride might have altered. The new form of copper chloride would be thermally more stable during manufacturing, delivery or storage conditions compared to the control sample. Hence, Biofield Energy Treated copper chloride would be advantageous to design more efficacious nutraceutical and pharmaceutical formulations that may provide a better therapeutic response against cancer, inflammation, wound healing, etc.

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