OPEN ACCESS
Freely Available Online

JOURNAL OF NEW DEVELOPMENTS IN CHEMISTRY
ISSN NO: 2377-2549

Research Article

DOI : 10.14302/issn.2377-2549.jndc-18-2507

# Consciousness Energy Healing Treatment: Spectroscopic and Calorimetric Evaluation of the Biofield Energy Treated Hydroxypropyl β-Cyclodextrin

Dahryn Trivedi[1], Mahendra Kumar Trivedi[1], Alice Branton[1], Gopal Nayak[1], Snehasis Jana[2,*]

[1]Trivedi Global, Inc., Henderson, USA

[2]Trivedi Science Research Laboratory Pvt. Ltd., Bhopal, India

## Abstract

Hydroxypropyl β-Cyclodextrin (HPBCD) used in food, pharmaceutical, chemical industries, as well as environmental, and agriculture engineering. But the major issue related to HPBCD is the low solubility profile. In this study, the influence of the Consciousness Energy Healing Treatment (the Trivedi Effect®) on the physicochemical properties of HPBCD was evaluated using spectroscopic and calorimetric analytical techniques. The test sample (HPBCD) was divided into control sample and treated sample. The control sample did not receive the Biofield Energy Treatment. Whereas, the treated sample received the Biofield Energy Treatment remotely by a renowned Biofield Energy Healer, Dahryn Trivedi. The particle size values of the treated sample were decreased by 3.28%($d_{10}$), 1.36%($d_{50}$), 0.45%($d_{90}$), and 1.04%{D(4,3)}; therefore, the specific surface area was increased by 1.9% compared with the control sample. The evaporation temperature of the treated HPBCD sample was significantly decreased by 19.89%; however, the latent heat of evaporation and latent heat of fusion were significantly increased by 56.27% and 47.41%, respectively compared with the control sample. The total weight loss in the treated HPBCD was decreased by 5.11%; whereas, the residue amount was significantly 309.67% more compared to the control sample. The results indicated that the Trivedi Effect® might have produced a new form of HPBCD which may show better thermal stability, solubility, dissolution rate, and bioavailability. This new form of HPBCD would be more useful for improvement of solubility of the lipophilic drug, preparation of cholesterol free food products, weight loss supplements, anti-obesity medication, stabilize volatile and unstable compounds, and other manufacturing industry using it as a raw material.

**Corresponding author:** Snehasis Jana, Trivedi Science Research Laboratory Pvt. Ltd., Bhopal, India. Tel: +91-022-25811234; Email: publication@trivedisrl.com

**Keywords:** The Trivedi Effect®, Hydroxypropyl β-Cyclodextrin, Complementary and Alternative Medicine, Consciousness Energy Healing Treatment, PXRD, Particle size, Surface area, DSC, TGA/DTG

**Received:** Nov 28, 2018 **Accepted:** Jan 30, 2019 **Published:** Feb 04, 2019

**Editor:** Sixing Lu, Department of Electrical and Computer Engineering, University of Arizona, United States.

## Introduction

Hydroxypropyl β-cyclodextrin (HPBCD) is a 7-membered sugar ring molecule produced from starch by enzymatic conversion. HPBCD used in food, pharmaceutical, chemical industries, as well as environmental, and agriculture engineering [1]. HPBCD nature is hydrophilic outside and hydrophobic inside. It can form complexes with hydrophobic (lipophilic) compounds. The unique structural features of HPBCD owe their stability to intramolecular hydrogen bonding between the hydroxyl groups of neighbouring glucopyranose units. Therefore they can improve the solubility, bioavailability and membrane permeability of such pharmaceutical/nutraceutical compounds [1-3]. In the food, pharmaceutical, and nutraceutical industries, it is also employed for the preparation of cholesterol-free products, weight loss supplements, alcohol powder, aerosols, and other anti-obesity medications. Due to its surface-active properties, it can also be used as an emulsifying fibre [4-6]. It can stabilize volatile or unstable compounds, reduce unwanted tastes and odour, deepen colour, improve light stability, and increase water solubility [1, 7]. It is also used to produce chiral HPLC columns for the separation of chiral enantiomers, and are also the core ingredient in air freshener products which "trap" odour, thereby reduce the lousy odour [2, 8]. The solubility profile of natural cyclodextrins is very poor; even the chemically modified cyclodextrin (i.e., HPBCD) can only achieve a 50% (w/v) concentration in water [2].

The Trivedi Effect®-Biofield Energy Healing Treatment has the significant impact on the physicochemical properties, i.e., crystallite size, thermal stability, particle size, surface area, solubility, and bioavailability of the pharmaceutical and nutraceutical compounds [9, 10, 11, 12]. The Trivedi Effect® is a natural and only scientifically proven phenomenon in which a skilled person can harness this inherently intelligent energy from the "Universe" and transmit it anywhere on the planet through the possible mediation of neutrinos [13]. Due to the continuous movement of the electrically charged particles like ions, cells, etc. inside the body a unique para-dimensional electromagnetic matrix (field) generated around the body of the living organism known as the "Biofield". The Biofield based Energy Healing Therapies have been accepted all over the world and reported in many scientific journals with significant outcomes against various disease conditions [14, 15]. National Institute of Health (NIH) and National Center for Complementary and Alternative Medicine (NCCAM) recommend and included the Energy therapy under Complementary and Alternative Medicine (CAM) category in addition to other therapies, medicines and practices such as hypnotherapy, healing touch, Qi Gong, Tai Chi, yoga, Ayurvedic medicine, chiropractic/osteopathic manipulation, massage, acupuncture, acupressure, relaxation techniques, guided imagery, Reiki, naturopathy, traditional Chinese herbs and medicines, homeopathy, aromatherapy, cranial sacral therapy, etc. The Energy Therapy has been accepted by most of the U.S.A. population [16, 17]. Similarly, the Trivedi Effect®-Consciousness Energy Healing Treatment also reported with its significant outcomes in different field of sciences, i.e., material science [18, 19], organic chemistry [20, 21], biotechnology [22, 23], microbiology [24, 25], agriculture [26, 27], and medical science [28, 29]. Seeing the above outstanding results, the current study was designed to evaluate the influence of the Trivedi Effect®-Consciousness Energy Healing Treatment on HPBCD sample using PSA, PXRD, DSC, and TGA/ DTG analytical techniques.

## Materials and Methods

### *Chemicals and Reagents*

The hydroxypropyl β-cyclodextrin (HPBCD) powder was bought from Tokyo Chemical Industry Co. Ltd, Japan, and the remaining chemicals used in the experiment were of analytical grade procured from India.

*Consciousness Energy Healing Treatment Strategies*

The test sample HPBCD was divided into two parts. One part of the HPBCD sample was treated with the Trivedi Effect®-Consciousness Energy Healing Treatment remotely under standard laboratory conditions for 3 minutes and known as a Biofield Energy Treated HPBCD sample. The Biofield Energy Healing Treatment was provided by the renowned Biofield Energy Healer, Dahryn Trivedi, USA, to the test sample. However, the other part of the HPBCD sample did not treat with the Biofield Energy Treatment and considered as control or untreated sample. This Biofield Energy

Treatment was provided through the healer's unique energy transmission process. But, the control sample was treated with a "sham" healer for the better comparison with the results of the Biofield Energy Treated HPBCD sample. The sham healer totally ignorant about the Biofield Energy Treatment. After the treatment, the Biofield Energy Treated and untreated samples were kept in sealed conditions and characterized using spectroscopic and calorimetric analytical techniques.

*Characterization*

The PSA, PXRD, DSC, and TGA analysis of HPBCD were performed. The PSA was performed using Malvern Mastersizer 2000, from the UK with a detection range between 0.01 µm to 3000 µm using the wet method [30, 31]. The PXRD analysis of HPBCD powder sample was performed with the help of Rigaku MiniFlex-II Desktop X-ray diffractometer (Japan) [32, 33]. The average size of crystallites was calculated from PXRD data using the Scherrer's formula (1)

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

Where G is the crystallite size in nm, k is the equipment constant (0.94), λ is the radiation wavelength (0.154056 nm for Kα1 emission), β is the full-width at half maximum, and θ is the Bragg angle [34].

Similarly, the DSC analysis of HPBCD was performed with the help of DSC Q200, TA instruments. The TGA/DTG thermograms of HPBCD were obtained with the help of TGA Q50 TA instruments and performed under the atmospheric air condition [30, 31].

The % change in particle size, specific surface area (SSA), peak intensity, crystallite size, melting point, latent heat, weight loss and the maximum thermal degradation temperature ($T_{max}$) of the Biofield Energy Treated sample was calculated compared with 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 powder XRD diffractograms of the control and Biofield Energy Treated HPBCD powder samples did not show sharp and intense peaks in the respective diffractograms (Figure 1). Therefore, it was decided that both the samples were amorphous in nature. The Biofield Energy Treatment might not have any effect on the crystallinity pattern of the HPBCD.

*Particle Size Analysis (PSA)*

The PSA analysis results of both the control and Biofield Energy Treated HPBCD powder sample are presented in Table 1. The particle size values of the control HPBCD sample at $d_{10}$, $d_{50}$, $d_{90}$, and D(4,3) were 22.485 µm, 77.681 µm, 163.367 µm, and 86.427 µm, respectively. Likewise, the particle sizes of the Biofield Energy Treated HPBCD powder sample at $d_{10}$, $d_{50}$, $d_{90}$, and D(4,3) were 21.748 µm, 76.621 µm, 162.632 µm, and 85.526 µm, respectively. The particle size values in the Biofield Energy Treated HPBCD powder sample was decreased by 3.28%, 1.36%, 0.45%, and 1.04% at $d_{10}$, $d_{50}$, $d_{90}$, and D(4,3), respectively compared to the control sample (Table 1). The specific surface area of the Biofield Energy Treated HPBCD powder sample (0.161 $m^2/g$) was increased by 1.9% compared with the control sample (0.158 $m^2/g$). Therefore, it was assumed that the Trivedi Effect®-Consciousness Energy Healing Treatment might be acting like an external force to break down the larger HPBCD particles to the smaller one, so the surface area was increased. The size, shape, and surface area of a particle have a significant impact on the solubility, dissolution rate, absorption, bioavailability, and also the therapeutic efficacy of a pharmaceutical substance [35-37]. As per the literature data, the solubility profile of HPBCD is 50% (w/v) in water [2]. The particle sizes were reduced and surface area also increased in the Biofield Energy Treated HPBCD compared to the control sample. Therefore, the surface-active properties of the Biofield Energy Treated HPBCD sample would be very high. The Biofield Energy Treated HPBCD would be more useful to improve the solubility of the lipophilic drug, stabilize volatile and unstable compounds, weight loss supplements, preparation of cholesterol free food products, and other anti-obesity medication [1, 4-7] and for the other industry using it as a raw material.

*Differential Scanning Calorimetry (DSC) Analysis*

The thermal analysis of both control and Biofield Energy Treated HPBCD samples showed two endothermic peaks in the thermograms. The control

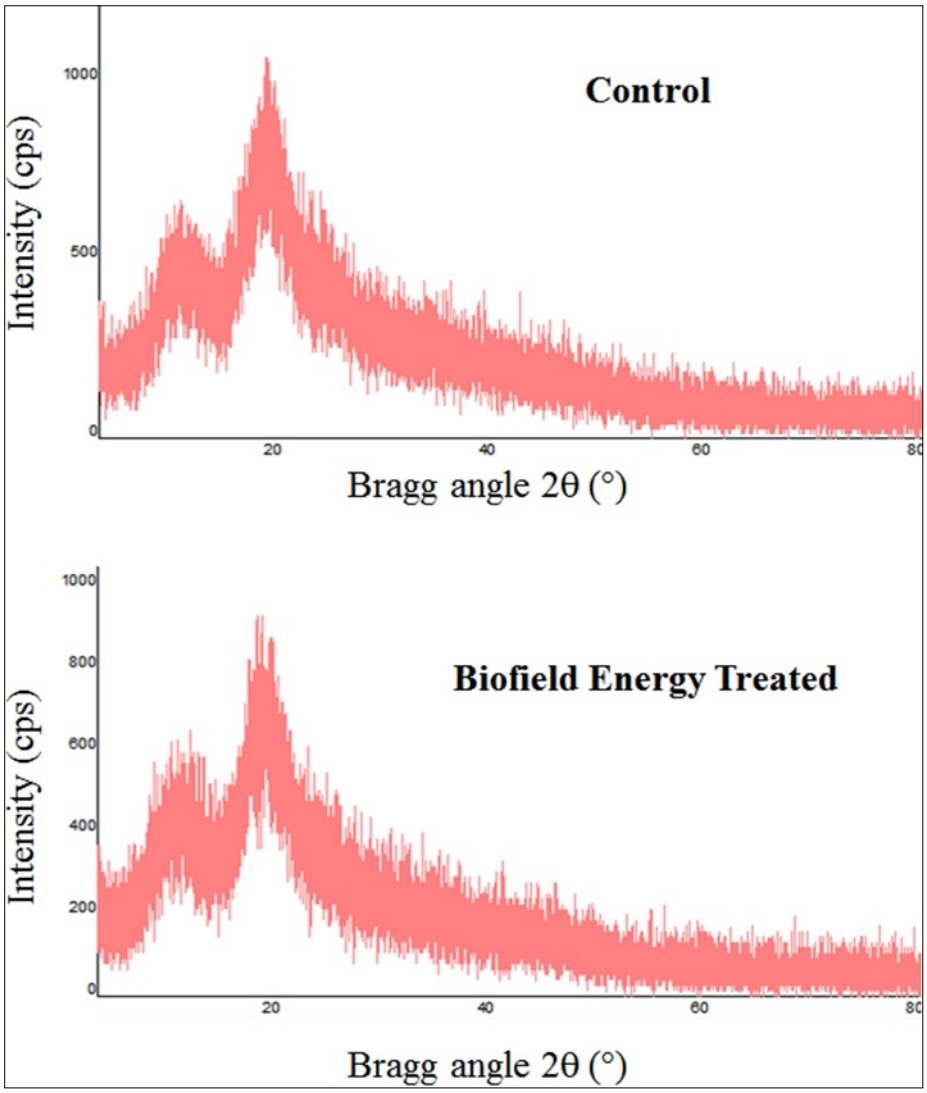


Figure 1. PXRD diffractograms of the control and Biofield Energy Treated HPBCD sample.

Table 1. Particle size distribution of the control and Biofield Energy Treated HPBCD sample.

| **Parameter** | **$d_{10}$ (µm)** | **$d_{50}$ (µm)** | **$d_{90}$ (µm)** | **D(4,3) (µm)** | **SSA ($m^2$/g)** |
|---|---|---|---|---|---|
| Control | 22.485 | 77.681 | 163.367 | 86.427 | 0.158 |
| Biofield Energy Treated | 21.748 | 76.621 | 162.632 | 85.526 | 0.161 |
| Percent change* (%) | -3.28 | -1.36 | -0.45 | -1.04 | 1.90 |

$d_{10}$, $d_{50}$, 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.

*denotes the percentage change in the particle size distribution of the Biofield Energy Treated HPBCD sample with respect to the control sample.

Table 2. DSC data for both control and Biofield Energy Treated samples of HPBCD sample.

| Sample | Melting point (°C) | | ΔH (J/g) | |
|---|---|---|---|---|
| | 1st Peak | 2nd Peak | Evaporation | Melting |
| Control Sample | 118.11 | 323.89 | 100.4 | 73.47 |
| Biofield Energy Treated | 94.62 | 325.58 | 156.9 | 108.3 |
| % Change* | -19.89 | 0.52 | 56.27 | 47.41 |

ΔH: Latent heat of evaporation/fusion, *denotes the percentage change of the Biofield Energy Treated HPBCD with respect to the control sample.

Table 3. TGA/DTG data of the control and Biofield Energy Treated samples of HPBCD sample.

| Sample | TGA | | DTG $T_{max}$ (°C) |
|---|---|---|---|
| | Total weight loss (%) | Residue % | |
| Control | 98.38 | 1.62 | 355.28 |
| Biofield Energy Treated | 93.35 | 6.65 | 355.35 |
| % Change* | -5.11 | 309.67 | 0.02 |

*denotes the percentage change of the Biofield Energy Treated HPBCD sample with respect to the control sample, $T_{max}$ = the temperature at which maximum weight loss takes place in TG or peak temperature in DTG.

HPBCD sample showed the endothermic peaks at 118.11°C and 323.89°C (Figure 2). Similarly, the Biofield Energy Treated sample showed the endothermic peaks at 94.62°C and 325.58°C (Figure 2). The 1st endothermic peak in the thermograms was due to the evaporation of water molecule from the sample, whereas the 2nd endothermic pick was due to the melting of HPBCD sample. The experimental results were well correlated with the literature data [38]. The evaporation temperature of the Biofield Energy Treated HPBCD sample was decreased by 19.89% compared with the control sample (Table 2). However, the melting temperature of the Biofield Energy Treated sample slightly increased by 0.52% compared with the control sample (Table 2). The latent heat of evaporation ($\Delta H_{evaporation}$) and latent heat of fusion ($\Delta H_{fusion}$) of the Biofield Energy Treated HPBCD sample were significantly increased by 56.27% and 47.41%, respectively compared with the control sample (Table 2). Overall, the thermal stability of the Biofield Energy Treated HPBCD sample was increased significantly compared to the control sample. Any change in the molecular chains and the crystal structure influence the latent heat of fusion [39, 40]. Hence, it was assumed that Dahryn's Biofield Energy Treatment could have improved the molecular chains strength of HPBCD which lead to the elevation of the thermal stability of the Biofield Energy Treated sample compared to the control sample.

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

The TGA/DTG thermograms of the control and Biofield Energy Treated HPBCD samples are presented in Figures 3 and 4. Both the samples showed two steps of the degradation process in the thermograms. The total weight loss in the Biofield Energy Treated HPBCD sample (93.35%) was decreased by 5.11% compared to the control sample (98.38%). Therefore, the residue amount was 309.67% more in the Biofield Energy Treated HPBCD sample compared to the control sample (Table 3).

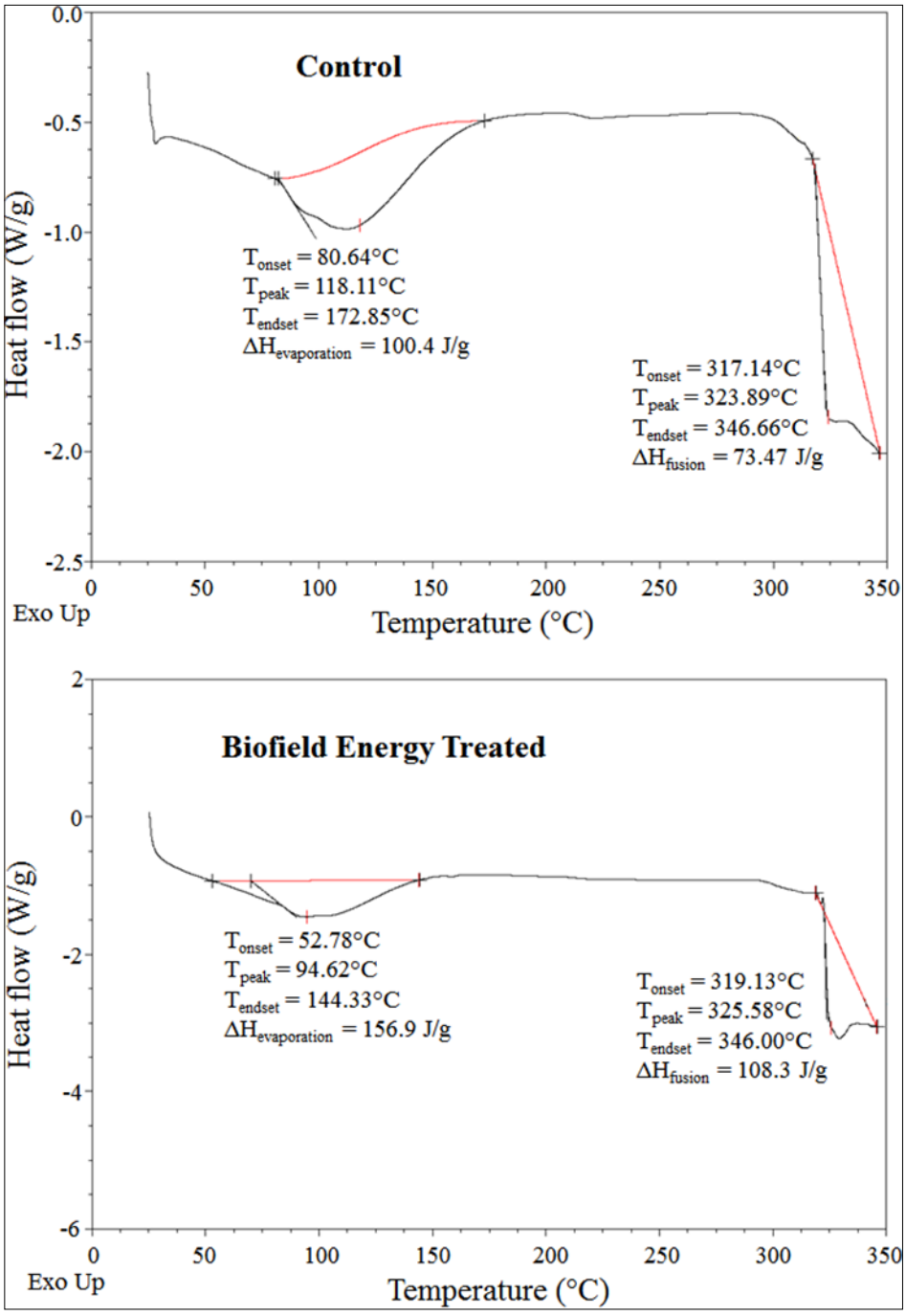


Figure 2. DSC thermograms of the control and Biofield Energy Treated HPBCD sample.

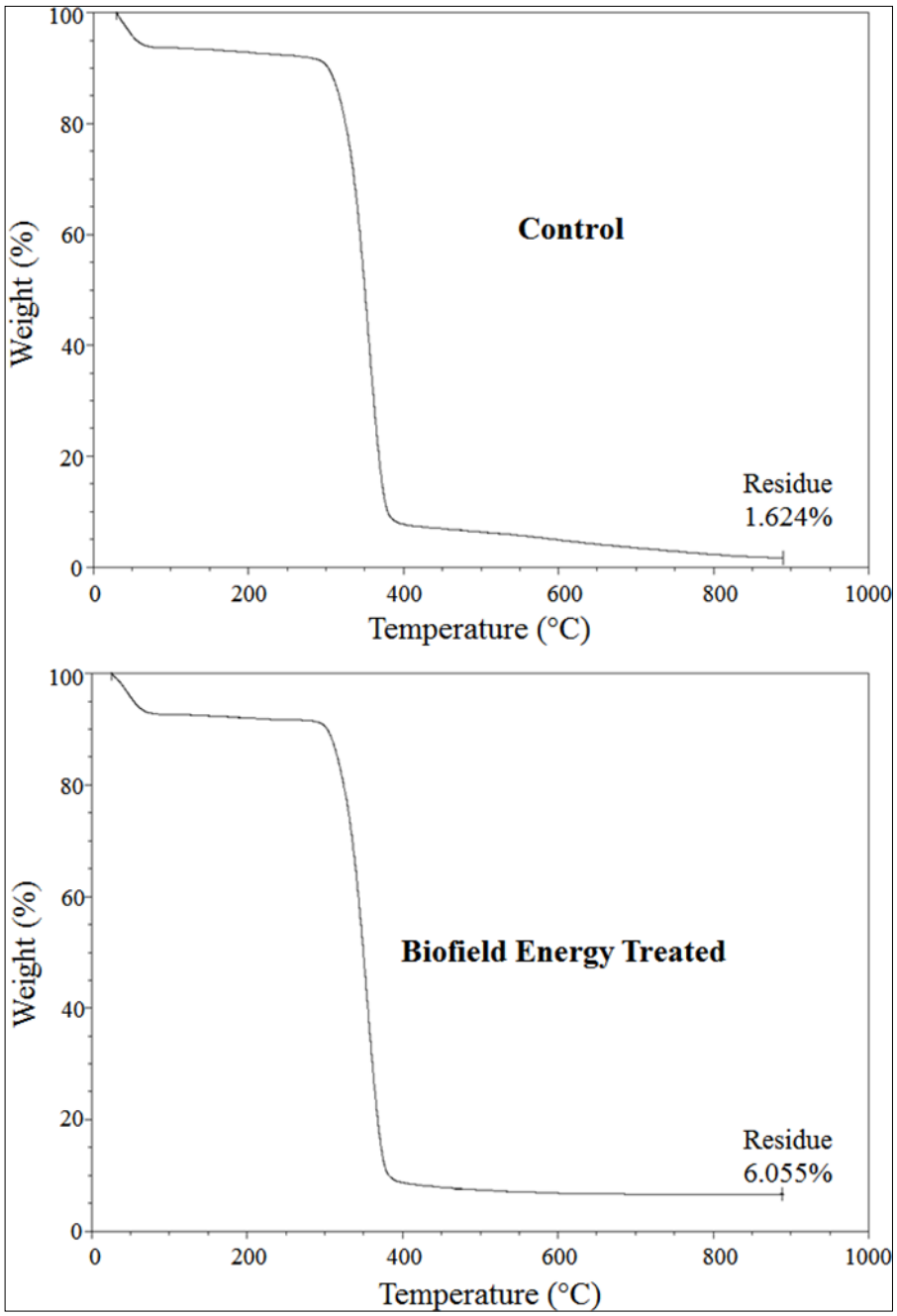


Figure 3. TGA thermograms of the control and Biofield Energy Treated HPBCD sample.

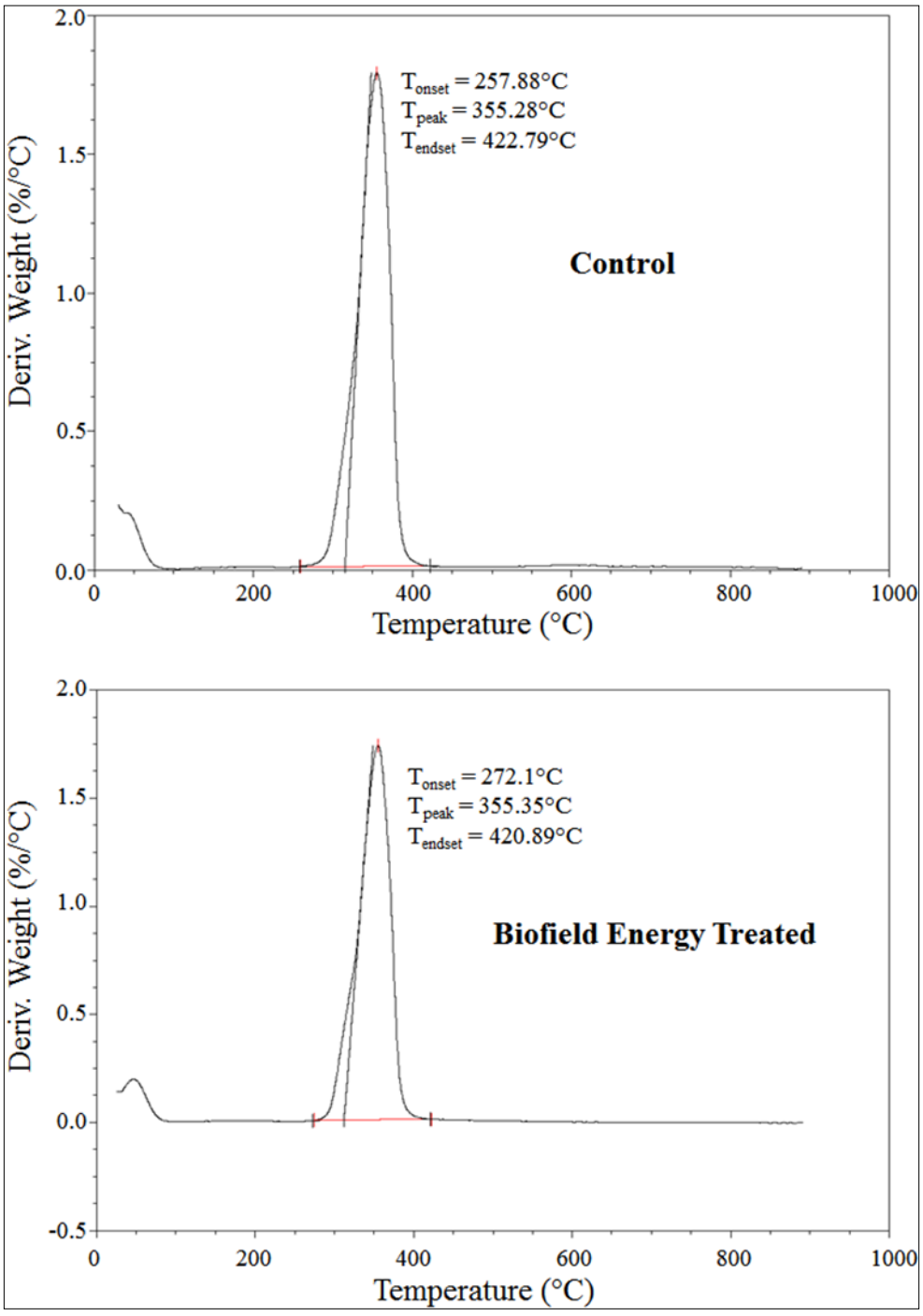


Figure 4. DTG thermograms of the control and Biofield Energy Treated HPBCD sample.

The DTG thermograms of the control and Biofield Energy Treated HPBCD sample exhibited one maximum thermal degradation temperature ($T_{max}$) peak (Figure 4). The $T_{max}$ of the Biofield Energy Treated HPBCD was almost close compared with the control sample. Overall, TGA/DTG thermal analysis revealed that the thermal stability of the Biofield Energy Treated HPBCD sample was increased compared with the control sample.

## Conclusions

The Trivedi Effect® (Consciousness Energy Healing Treatment) have a significant impact on the particle size, surface area, and thermal properties of HPBCD. The particle size values of the Biofield Energy Treated sample were decreased at $d_{10}$, $d_{50}$, $d_{90}$, and D (4,3) by 3.28%, 1.36%, 0.45%, and 1.04%, respectively compared to the control sample. Therefore, the specific surface area of the Biofield Energy Treated HPBCD powder sample was increased by 1.9% compared with the control sample. The evaporation temperature of the Biofield Energy Treated HPBCD sample was decreased by 19.89% compared with the control sample. However, the $\Delta H_{evaporation}$ and $\Delta H_{fusion}$ of the Biofield Energy Treated HPBCD were significantly increased by 56.27% and 47.41%, respectively compared with the control sample. The total weight loss in the Biofield Energy Treated HPBCD was decreased by 5.11% compared with the control sample. Hence, the residue amount was 309.67% more in case of the Biofield Energy Treated HPBCD sample compared to the control sample. The results indicated that the Consciousness Energy Healing Treatment might produce a new form of HPBCD which may show better solubility, dissolution rate, absorption, bioavailability, and thermal stability. The new form of HPBCD would be more useful for the improvement of solubility of the lipophilic drug, stabilize volatile and unstable compounds, weight loss supplements, preparation of cholesterol free food products, anti-obesity medication and other manufacturing industry using it as a raw material.

## Acknowledgements

The authors are grateful to Central Leather Research Institute, SIPRA Lab. Ltd., Trivedi Science, Trivedi Global, Inc., Trivedi Testimonials, and Trivedi Master Wellness for their assistance and support during this work.

## References

1. https://en.wikipedia.org/wiki/Cyclodextrin. Retrieved 22-06-2018.
2. https://www.sigmaaldrich.com/catalog/product/sigma/h107?lang=en&region=IN. Retrieved 22-06-2018.
3. Morrison PWJ, Connon CJ, Khutoryanskiy VV (2013) Cyclodextrin-mediated enhancement of riboflavin solubility and corneal permeability. Mol Pharmaceutics 10: 756-762.
4. Artiss JD, Brogan K, Brucal M, Moghaddam M, Jen KL (2006) The effects of a new soluble dietary fiber on weight gain and selected blood parameters in rats. Metabolism. 55: 195-202.
5. Grunberger G, Jen KL, Artiss JD (2007) The benefits of early intervention in obese diabetic patients with FBCx: A new dietary fibre. Diabetes Metab Res Rev 23: 56-62.
6. Bouchal F, Skiba M, Chaffai N, Hallouard F, Fatmi S, Lahiani-Skiba M (2015) Fast dissolving cyclodextrin complex of piroxicam in solid dispersion Part I: Influence of $\beta$-CD and HP$\beta$-CD on the dissolution rate of piroxicam. Int J Pharm 478: 625-632.
7. Marcolino VA, Zanin GM, Durrant LR, Benassi MDT, Matioli G (2011) Interaction of curcumin and bixin with $\beta$-cyclodextrin: Complexation methods, stability, and applications in food. J Agric Food Chem 59: 3348-3357.
8. Motoyama A, Suzuki A, Shirota O, Namba R (2002) Direct determination of pindolol enantiomers in human serum by column-switching LC-MS/MS using a phenylcarbamate-$\beta$-cyclodextrin chiral column. J Pharm Biomed Anal 28: 97-106.
9. Trivedi MK, Patil S, Shettigar H, Bairwa K, Jana S (2015) Effect of biofield treatment on spectral properties of paracetamol and piroxicam. Chem Sci J 6: 98.
10. Trivedi MK, Branton A, Trivedi D, Nayak G, Plikerd WD, Surguy PL, Kock RJ, Piedad RB, Callas RP, Ansari SA, Barrett SL, Friedman S, Christie SL, Chen Liu S-M, Starling SE, Jones S, Allen SM, Wasmus SK, Benczik TA, Slade TC, Orban T, Vannes VL,

Schlosser VM, Albino YSY, Panda P, Sethi KK, Jana S (2017) A systematic study of the biofield energy healing treatment on physicochemical, thermal, structural, and behavioral properties of magnesium gluconate. International Journal of Bioorganic Chemistry 2: 135-145.

11. Branton A, Jana S (2017) The influence of energy of consciousness healing treatment on low bioavailable resveratrol in male *Sprague Dawley* rats. International Journal of Clinical and Developmental Anatomy 3: 9-15.
12. Trivedi MK, Branton A, Trivedi D, Nayak G, Nykvist CD, Lavelle C, Przybylski DP, Vincent DH, Felger D, Konersman DJ, Feeney EA, Prague JA, Starodub JL, Rasdan K, Strassman KM, Soboleff L, Mayne MA, Keesee MM, Pillai PN, Ansley PC, Schmitz RD, Sodomora SM, Sethi KK, Panda P, Jana S (2017) Liquid chromatography – mass spectrometry (LC-MS) analysis of *Withania somnifera* (Ashwagandha) root extract treated with the energy of consciousness. American Journal of Quantum Chemistry and Molecular Spectroscopy 2: 1-10.
13. Trivedi MK, Mohan TRR (2016) Biofield energy signals, energy transmission and neutrinos. American Journal of Modern Physics 5: 172-176.
14. Rubik B, Muehsam D, Hammerschlag R, Jain S (2015) Biofield science and healing: history, terminology, and concepts. Glob Adv Health Med 4: 8-14.
15. Oschman J (2003) Energy medicine in therapeutics and human performance. Philadelphia: Butterworth Heinemann 1-12.
16. Barnes PM, Bloom B, Nahin RL (2008) Complementary and alternative medicine use among adults and children: United States, 2007. Natl Health Stat Report 12: 1-23.
17. Koithan M (2009) Introducing complementary and alternative therapies. J Nurse Pract 5: 18-20.
18. Trivedi MK, Mohan R, Branton A, Trivedi D, Nayak G, Latiyal O, Jana S (2015) Evaluation of atomic, physical, and thermal properties of bismuth oxide powder: An impact of biofield energy treatment. American Journal of Nano Research and Applications 3: 94-98.
19. Trivedi MK, Tallapragada RM, Branton A, Trivedi D, Nayak G, Latiyal O, Jana S (2015) Physicochemical and atomic characterization of silver powder after biofield treatment. J Bioengineer Biomedical Sci 5: 165.
20. Trivedi MK, Branton A, Trivedi D, Nayak G, Sethi KK, Jana S (2016) Gas chromatography-mass spectrometry based isotopic abundance ratio analysis of biofield energy treated methyl-2-napthylether (Nerolin), American Journal of Physical Chemistry 5: 80-86.
21. Trivedi MK, Branton A, Trivedi D, Nayak G, Panda P, Jana S (2016) Isotopic abundance ratio analysis of 1,2,3-trimethoxybenzene (TMB) after biofield energy treatment (the Trivedi Effect®) using gas chromatography-mass spectrometry, American Journal of Applied Chemistry 4: 132-140.
22. Trivedi MK, Branton A, Trivedi D, Nayak G, Mondal SC, Jana S (2015) Morphological characterization, quality, yield and DNA fingerprinting of biofield energy treated alphonso mango (*Mangifera indica L.*). Journal of Food and Nutrition Sciences 3: 245-250.
23. Nayak G, Altekar N (2015) Effect of a biofield treatment on plant growth and adaptation. J Environ Health Sci 1: 1-9.
24. Trivedi MK, Branton A, Trivedi D, Shettigar H, Nayak G, Gangwar M, Jana S (2015) Antibiogram typing of biofield treated multidrug resistant strains of *Staphylococcus species*. American Journal of Life Sciences 3: 369-374.
25. Trivedi MK, Branton A, Trivedi D, Shettigar H, Nayak G, Mondal SC, Jana S (2015) Antibiogram, biochemical reactions and genotyping characterization of biofield treated *Staphylococcus aureus*. American Journal of BioScience 3: 212-220.
26. Sances F, Flora E, Patil S, Spence A, Shinde V (2013) Impact of biofield treatment on ginseng and organic blueberry yield. AGRIVITA, Journal of Agricultural Science 35: 22-29.
27. 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 Genetics and Genomics 3: 74-80.

28. Trivedi MK, Branton A, Trivedi D, Nayak G, Lee AC, Hancharuk A, Sand CM, Schnitzer DJ, Thanasi R, Meagher EM, Pyka FA, Gerber GR, Stromsnas JC, Shapiro JM, Streicher LN, Hachfeld LM, Hornung MC, Rowe PM, Henderson SJ, Benson SM, Holmlund ST, Salters SP, Gangwar G, Jana S (2017) An investigation of the Trivedi Effect®-Energy of Consciousness Healing Treatment to modulate the immunomodulatory effect of herbomineral formulation in male *Sprague Dawley* rats. Advances in Materials 5: 144-153.
29. 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.
30. Trivedi MK, Sethi KK, Panda P, Jana S (2017) A comprehensive physicochemical, thermal, and spectroscopic characterization of zinc (II) chloride using X-ray diffraction, particle size distribution, differential scanning calorimetry, thermogravimetric analysis/differential thermogravimetric analysis, ultraviolet-visible, and Fourier transform-infrared spectroscopy. International Journal of Pharmaceutical Investigation 7: 33-40.
31. Trivedi MK, Sethi KK, Panda P, Jana S (2017) Physicochemical, thermal and spectroscopic characterization of sodium selenate using XRD, PSD, DSC, TGA/DTG, UV-vis, and FT-IR. Marmara Pharmaceutical Journal 21/2: 311-318.
32. Desktop X-ray Diffractometer "MiniFlex+". The Rigaku Journal 14: 29-36, 1997.
33. Zhang T, Paluch K, Scalabrino G, Frankish N, Healy AM, Sheridan H (2015) Molecular structure studies of (1S,2S)-2-benzyl-2,3-dihydro-2-(1Hinden-2-yl)-1H -inden-1-ol. J Mol Struct 1083: 286-299.
34. 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.
35. Chereson R (2009) Bioavailability, bioequivalence, and drug selection. In: Makoid CM, Vuchetich PJ, Banakar UV (eds) Basic pharmacokinetics (1st edn) Pharmaceutical Press, London.
36. 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.
37. Buckton G, Beezer AE (1992) The relationship between particle size and solubility. Int J Pharmaceutics 82: R7-R10.
38. Moriwaki C, Costa GL, Ferracini CN, de Moraes FF, Zanin GM, Pineda EAG, Matioli G (2008) Enhancement of solubility of Albendazole by complexation with *β*-cyclodextrin. Brazilian Journal of Chemical Engineering 25: 255-267.
39. Zhao Z, Xie M, Li Y, Chen A, Li G, Zhang J, Hu H, Wang X, Li S (2015) Formation of curcumin nanoparticles *via* solution-enhanced dispersion by supercritical $CO_2$. Int J Nanomedicine 10: 3171-3181.
40. Vadukumpully S, Paul J, Mahanta N, Valiyaveettil S (2011) Flexible conductive graphene/poly (vinyl chloride) composite thin films with high mechanical strength and thermal stability. Carbon 49: 198-205.