

Effect of Biofield Energy Treatment on Physical and Structural Properties of Calcium Carbide and Praseodymium Oxide

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To cite this article:

Mahendra Kumar Trivedi, Rama Mohan Tallapragada, Alice Branton, Dahryn Trivedi, Gopal Nayak, Omprakash Latiyal, Snehasis Jana. Effect of Biofield Energy Treatment on Physical and Structural Properties of Calcium Carbide and Praseodymium Oxide. *International Journal of Materials Science and Applications*. Vol. 4, No. 6, 2015, pp. 390-395. doi: 10.11648/j.ijmsa.20150406.14

Abstract: Calcium carbide (CaC_2) is known for its wide applications in the production of acetylene and calcium cyanamide, whereas praseodymium Oxide (Pr_6O_{11}) is used in sensors and high-temperature pigments. The present study was designed to evaluate the effect of biofield energy treatment on the physical and structural properties of CaC_2 and Pr_6O_{11} powder. The powder samples of both compounds were equally divided into two parts, referred as control and treated. The treated part of both compounds was subjected to Mr. Trivedi's biofield energy treatment. After that, both control and treated samples were investigated using X-ray diffraction (XRD) and Fourier transform infrared (FT-IR) spectroscopy. The XRD data revealed that the biofield energy treatment has increased the lattice parameter of unit cell by 3.35% in the treated CaC_2 sample as compared to the control. The density of treated CaC_2 sample was reduced upto 4.49% and molecular weight was increased upto 4.70% as compared to the control. The crystallite size of CaC_2 was reduced from 98.19 nm (control) to 52.93 nm in the treated CaC_2 sample as compared to the control. The FT-IR analysis exhibited that the absorption band attributed to C=C stretching vibration was shifted to higher wavenumber as compared to the control. Thus, above data suggested that biofield energy treatment has considerable impact on the physical and structural properties of CaC_2 . Besides, in Pr_6O_{11} , the XRD did not show any significant change in lattice parameter, density and molecular weight. However, the FT-IR spectra revealed that the absorption band attributing to Pr-O stretching vibration was shifted from 593 cm^{-1} (control) to higher wavenumber 598 cm^{-1} in the treated Pr_6O_{11} sample. Therefore, the biofield energy treatment could be applied to modify the CaC_2 and Pr_6O_{11} powder for the use in chemical industries.

Keywords: Calcium Carbide, Praseodymium Oxide, Biofield Energy Treatment, X-Ray Diffraction, Fourier Transform Infrared Spectroscopy

1. Introduction

Calcium carbide is an important industrial material, used in the production of acetylene and cyanamide [1]. It is a colorless solid, exist in the form of a distorted rock-salt structure with the C_2^{2-} units lying parallel [2]. It gains significant attention due to its use in the desulfurization of steel and cast iron in steel industries. It acts as a fuel in steelmaking to extend the scrap ratio to liquid iron [3]. In addition, it plays an important role in artificial ripening of fruit, which provides the acetylene gas similar to ethylene

[4]. It is synthesized from a mixture of lime and coke in electric arc furnace at very high temperature approximately 2000°C [5]. Due to high temperature, it is difficult to control the physical and structural properties of CaC_2 using conventional methods. Thus, it is important to find a suitable approach which can modify the physical and structure properties of CaC_2 , after synthesis from convention methods.

Over the past few years, praseodymium oxide (Pr_6O_{11}) has been utilized in different applications such as high-temperature pigments [6], and catalysts [7, 8]. It is also used in sensors and oxygen storage components of three-way automotive catalysts [9]. Currently, it is synthesized by various processes such as

solid-state reactions [10-12], a molten salt method [13], or sol-gel [14]. However, these processes have certain limitation such as large crystallite size, non-uniformity, *etc.* Furthermore, in order to use these compounds in industries, its physical and structural properties play a crucial role. Thus, it is important to avail an alternative approach *i.e.* biofield energy treatment, which may be used to modify the physical and structural properties of CaC_2 and Pr_6O_{11} powder.

It is well established that the energy can be transferred from one place to another place using several scientific techniques. Further, it exists in various forms such as thermal, electric, kinetic, nuclear, *etc.* The living organisms are exchanging their energy with the environment for their health maintenance [15]. Moreover, a human has the capability to harness the energy from the environment/Universe and transmit it to any object around the Globe. The object(s) receive the energy and respond in a useful way that is called biofield energy, and this process is known as biofield energy treatment. The National Center for Complementary and Alternative Medicine (NCCAM) has recommended the use of alternative CAM therapies (*e.g.* healing therapy) in the healthcare sector [16]. Moreover, Mr. Trivedi's unique biofield energy treatment (The Trivedi Effect®) had been extensively studied in materials science [17,18]. It has substantially altered the atomic, physical and thermal properties in metals [18, 19] and ceramics [20]. Thus, after considering the effect of biofield energy treatment on metals and ceramics, this study was designed to evaluate the effect of this treatment on the physical and structural properties of the CaC_2 and Pr_6O_{11} powder using X-ray diffraction (XRD) and Fourier transform infrared (FT-IR) spectroscopy.

2. Materials and Methods

The CaC_2 and Pr_6O_{11} powder were purchased from Sigma Aldrich, USA. Each powder samples were divided into two groups: control and treated. The control sample of both compound were remained as untreated, while the treated samples were in sealed pack, handed over to Mr. Trivedi for biofield energy treatment under standard laboratory condition. Mr. Trivedi provided the treatment through his energy transmission process to the treated samples without touching the samples. The control and treated samples were analyzed using XRD and FT-IR.

2.1. XRD Study

The Phillips, Holland PW 1710 X-ray diffractometer system was used to perform the XRD analysis of control and treated samples. From the XRD system, the data was obtained in the form of a table containing Bragg angles, the peak intensity counts, relative intensity (%), d-spacing value (Å), and full width half maximum (FWHM) (θ°) for each peak. After that, the PowderX software was used to calculate the crystal structure parameters such as lattice parameter and unit cell volume of the control and treated samples. Also, the Scherrer equation was used to compute the crystallite size as

given below:

$$\text{Crystallite size } (G) = \frac{k\lambda}{b \cos\theta}$$

Here, k is equipment constant (=0.94), $\lambda = 1.54056 \text{ \AA}$, and b is full width half maximum (FWHM). After that, the percentage change in G was calculated using following formula:

$$\text{Percent change in crystallite size } (G) = \frac{G_t - G_c}{G_c} \times 100$$

Where, G_c and G_t are the crystallite size of control and treated samples, respectively.

2.2. FT-IR Spectroscopy

The FT-IR analysis of control and treated samples were accomplished on Shimadzu's Fourier transform infrared spectrometer (Japan). The spectra was obtained with frequency range of $4000\text{-}500 \text{ cm}^{-1}$. The purpose of the FT-IR analysis was to study the impact of biofield energy treatment on dipole moment, force constant and bond strength in the compounds

3. Results and Discussion

3.1. XRD Study

The XRD technique is a quantitative and non-destructive technique, which is commonly used to study the crystal structure and related parameters of a compound. Fig. 1 shows the XRD diffractograms of control and treated CaC_2 samples. The control CaC_2 sample showed the intensive XRD peaks at Bragg's angle (2θ) 26.57° , 27.95° , 32.51° , and 37.34° which were supported by the literature [21]. However, the treated CaC_2 sample T1 exhibited the crystalline peaks at Bragg's angle 27.24° , 28.39° , 32.10° , 34.00° , and 37.27° . Furthermore, the treated sample T2 showed the peaks at 33.04° , 34.77° , 38.18° , and 44.61° . Thus, above data suggested that the positions of the peaks in the treated samples were significantly altered as compared to the control. The alteration in peak positions in treated samples could be due to the energy transferred through biofield energy treatment. It is possible that the energy transferred through treatment induced stress, which may generate internal strain in the treated samples and that might be responsible for the alteration in peak positions in the treated samples as compared to the control. Besides, the crystal structure parameters of both control and treated CaC_2 samples were computed using PowderX software and presented in Table 1. The data exhibited that the lattice parameter of unit cell was changed from 8.36 \AA (control) to 8.32 \AA and 8.64 \AA in treated CaC_2 samples T1 and T2, respectively. It indicated that the lattice parameter was increased by 3.35% in T2, though no significant change was found in T1 as compared to the control (Fig. 2). The data also showed that the unit cell volume was increased by 1.83 and

4.70% in T1 and T2, respectively as compared the control. The increase in unit cell volume led to reduce the density by 1.80 and 4.49% in T1 and T2, respectively as compared the control. On the contrary, the molecular weight was increased by 1.83 and 4.7% in T1 and T2, respectively as compared to the control. Thus, the above results suggested that the biofield energy treatment probably acted at nuclear level to cause these modifications. It is assumed that the energy transferred through biofield treatment could be in the form of the neutrinos, which probably acted at nuclear level to cause these modifications at nuclear level. Besides, it was also observed that the crystallite size was reduced from 98.19 nm (control) to 74.35 nm and 52.93 nm in T1 and T2 samples, respectively. It was reported that presence of internal strain

leads to fracture the crystallite into sub-crystallites [22]. Thus, it assumed that internal strain induced through biofield energy treatment led to reduce the crystallite size in treated CaC_2 samples. It is known that the CaC_2 is widely used in the production of acetylene gas in industries. In this process, CaC_2 reacts with water to form acetylene gas; thus for this chemical reaction the surface area and crystallite size of CaC_2 play an important role [23]. It was reported that the decrease in crystallite size led to increase the surface area and increase the chemical reactivity [24]. Thus, based on this, it is assumed that the decrease in crystallite size in treated CaC_2 may increase the rate of the reaction for the production of acetylene gas and that may resulted into higher yield as compared to the control.

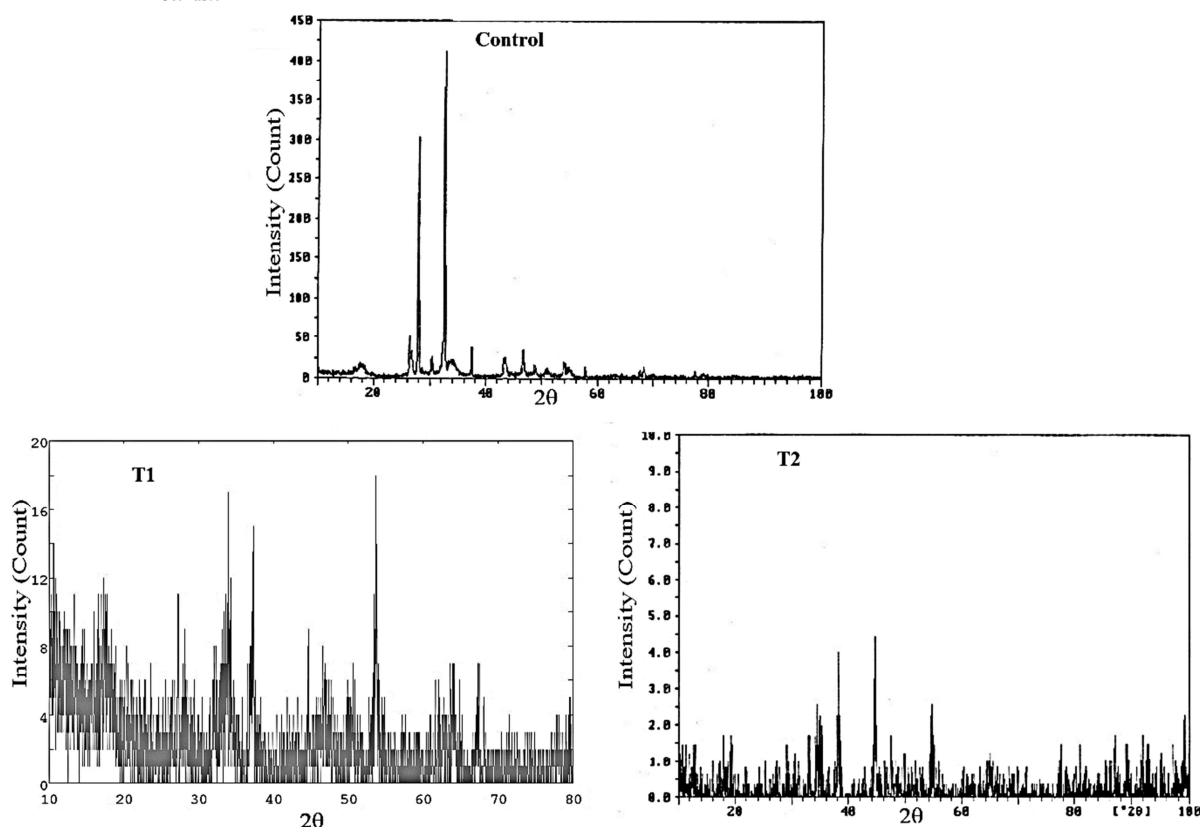


Fig. 1. X-ray diffractogram of calcium carbide powder.

The XRD diffractogram of control and treated Pr_6O_{11} samples is presented in Fig. 3. It shows the intensive XRD peaks at Bragg's angle (2θ) 28.23° , 32.72° , 46.93° , and 55.68° , which were corresponded to crystalline planes (111), (200), (220), and (311), respectively according to the joint committee on powder diffraction standards (JCPDS) card no. 42-1121 [25]. However, the treated sample showed the peaks at 28.25° , 32.71° , 46.96° , and 55.72° . Thus, data suggested that the peaks position were slightly altered due to biofield energy treatment. Moreover, the lattice parameter, unit cell volume, density and molecular weight did not show any significant changes in treated sample as compared to the control.

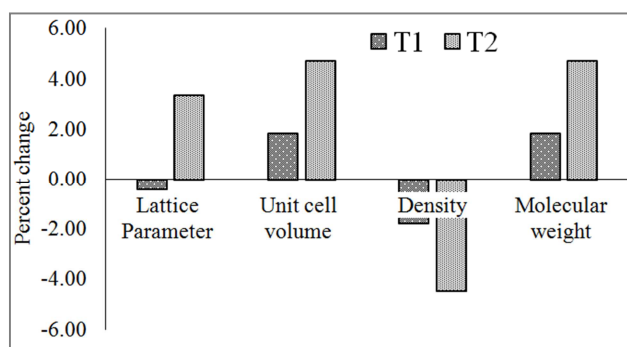


Fig. 2. Effect of biofield energy treatment on lattice parameter; unit cell volume, density, and molecular weight of calcium carbide.

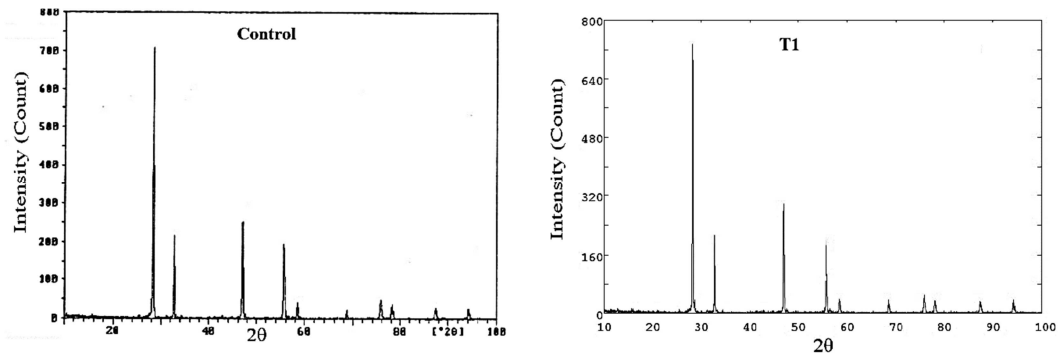


Fig. 3. X-ray diffractogram of praseodymium oxide powder.

Table 1. The crystal structure parameter calcium carbide and praseodymium oxide powder.

Compound	Group	Lattice parameter (Å)	Unit cell volume ($\times 10^{-23}$ cm ³)	Density (g/cc)	Molecular weight (g/mol)	Crystallite size (nm)
CaC ₂	Control	8.36	38.45	2.23	64.55	98.19
	T1	8.32	39.15	2.19	65.73	74.35
	T2	8.64	40.26	2.13	67.58	52.93
Pr ₆ O ₁₁	Control	5.47	16.37	6.98	1030.85	71.09
	T1	5.47	16.36	6.98	1030.33	71.09

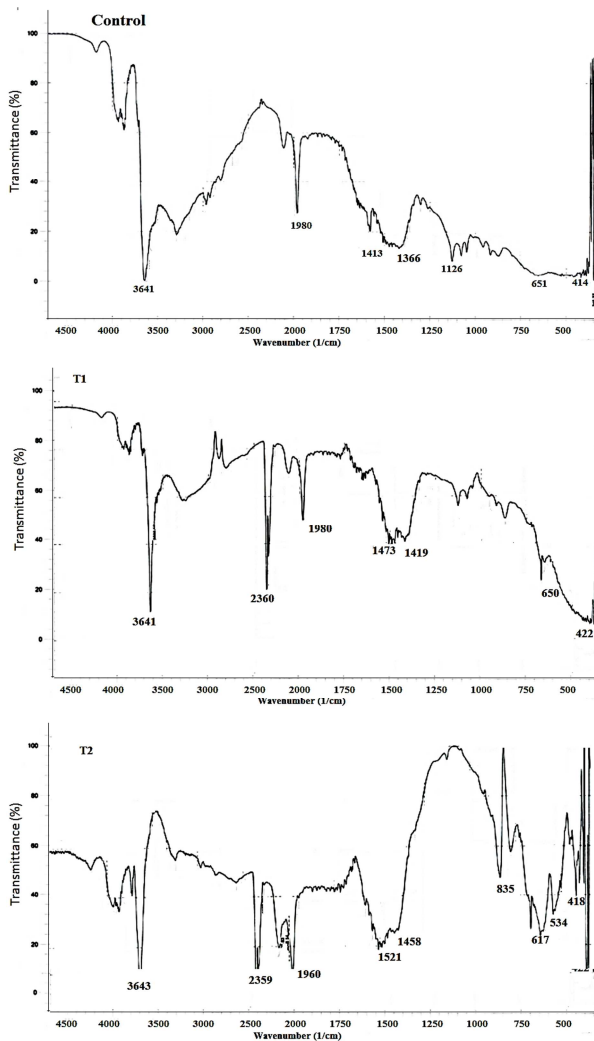


Fig. 4. FT-IR spectra of calcium carbide powder.

3.2. FT-IR Spectroscopy

The FT-IR spectra of control and treated CaC₂ samples are presented in Fig. 4. It showed the absorption bands at 3641 cm⁻¹, 3641 cm⁻¹ and 3643 cm⁻¹ in control, T1, and T2, respectively, which can be attributed to -OH stretching vibration. The emergence of these peak could be due to moisture absorption by the sample. Further, doublet found at 1413 and 1366 in control was due to C=C stretching vibrations, however, it was shifted to 1473 cm⁻¹ and 1419 cm⁻¹ in T1; and 1521 cm⁻¹ and 1458 cm⁻¹ in T2 sample [26]. In addition, the absorption peak attributing to Ca-C bond was found at 414 cm⁻¹ (control) that was shifted to higher wavenumber 422 cm⁻¹ and 418 cm⁻¹ in T1 and T2, respectively.

It was reported that the wavenumber ($\bar{\nu}$) is directly related to the bond force constant (k) as following [27]:

$$\bar{\nu} = \frac{1}{2\pi c} \sqrt{\frac{k}{\mu}} \quad (1)$$

Here, μ is the effective mass of atoms, which form the bond and c is the speed of light (3×10^8 m/s). The equation inferred that the increase in bond force constant can lead to shift the absorption wavenumber toward higher side. Previously, our group reported that biofield energy treatment has altered the bond length of Ti-O bond in barium titanate [28]. Based on this, it is assumed that the bond force constant of C=C bond probably increased after biofield energy treatment.

Fig. 5 shows the FT-IR spectra of control and treated Pr₆O₁₁ samples. The spectra shows the absorption bands at 3445 cm⁻¹ in control and treated Pr₆O₁₁ sample, which can be attributed to -OH stretching vibration. The emergence of these peak could be due to moisture absorption by the sample

[27]. Further, the peak observed at 593 cm^{-1} (control) was shifted to higher wavenumber 598 cm^{-1} in treated sample, which was assigned to stretching vibration Pr-O [29]. Based on equation (1), it is assumed that the biofield energy treatment possibly increased the bond force constant of Pr-O bond, due to which the peak was shifted to higher wavenumber in the treated sample as compared to the control. Further, it is possible that the energy transferred through biofield energy treatment probably acted on the atomic bonding level to cause these modifications.

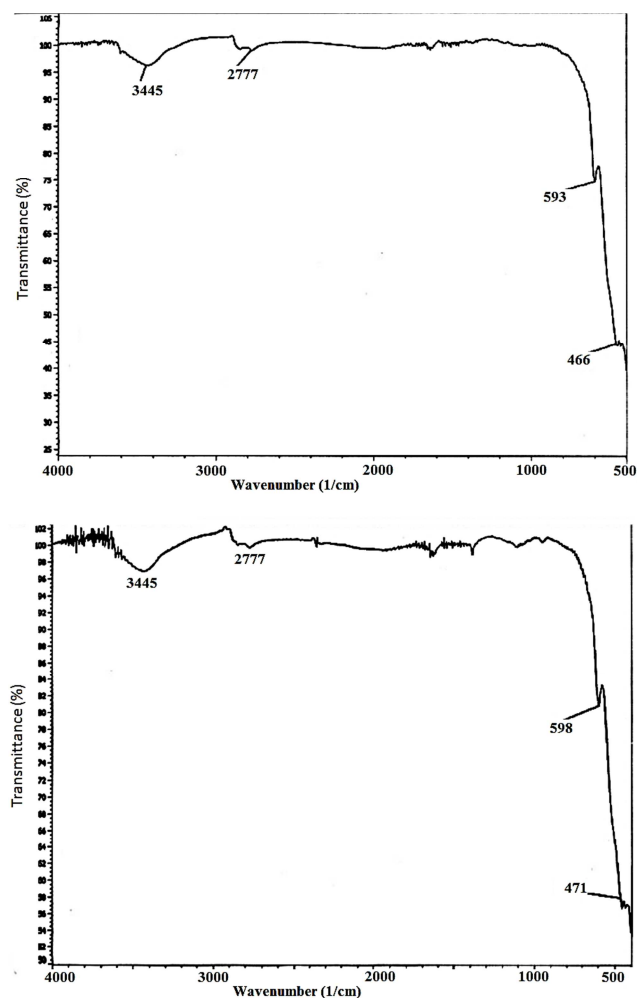


Fig. 5. FT-IR spectra of praseodymium oxide powder.

4. Conclusions

The XRD data revealed that the biofield energy treatment has increased the lattice parameter of unit cell by 3.35% in treated CaC_2 sample as compared to the control. The density of treated CaC_2 sample was reduced upto 4.49% and molecular weight was increased upto 4.70% as compared to the control. The crystallite size of CaC_2 was reduced from 98.19 nm (control) to 52.93 nm in treated CaC_2 sample as compared to the control. The decrease in crystallite size in treated sample may enhance the reactivity of CaC_2 in the production of acetylene gas. The FT-IR analysis exhibited that the absorption band attributed to C=C stretching vibrations was shifted to

higher wavenumber as compared to the control. Thus, above data suggested that biofield energy treatment has considerable impact on the physical and structural properties of CaC_2 . Besides, in Pr_6O_{11} , the XRD did not show any significant changes in lattice parameter, density and molecular weight after biofield treatment. However, the FT-IR revealed that the absorption band attributing to Pr-O stretching vibration was shifted from 593 cm^{-1} (control) to higher wavenumber 598 cm^{-1} in the treated Pr_6O_{11} sample. Therefore, the biofield energy treatment could be applied to modify the physical and structural properties of CaC_2 and Pr_6O_{11} powder for the use chemical industries respectively.

Acknowledgments

Authors would like to acknowledge Dr. Cheng Dong of NLSC, Institute of Physics, and Chinese academy of sciences for supporting in analyzing the XRD data using Powder-X software. The authors would also like to thank Trivedi Science, Trivedi Master Wellness and Trivedi Testimonials for their support during the work.

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