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Effect of Biofield Treatment on the Physical and Thermal Characteristics of Aluminium Powders

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Abstract

Aluminium powders are used in a wide range from propelling rockets to improving personal hygiene. More popular industrial applications include manufacture of silver metallic pigments, paints, inks, plastics, packaging, textiles and aerospace industry. As thick film pastes used in the manufacture of silicon solar cells, and as reducing agent and sources of heat, used in alumina thermic and exothermic applications.

In the present investigation, Aluminium powders were exposed to non-contact Biofield treatment. Both the exposed and unexposed powders were later characterized by various techniques. The average particle size, after a slight initial decrease was found to increase after 80 days of treatment substantially, which suggested the operation of competing mechanisms fracture and sintering (micro welding). The BET surface area monotonically decreased which was consistent with increase in particle size. SEM photographs showed that samples exposed to Biofield after 38 days showed growth in particle size and particles joined at inter and intra particle boundaries. X-ray diffraction of the powder samples indicated both increase and decrease in crystallite size, unit cell volume, change in nuclear charge per unit volume of atom and atomic weight of samples exposed to Biofield even after 106 days.

These results indicated that properties of Aluminium powders could be changed even up to atomic level by exposure to Biofield.

Keywords: Aluminium; Powders; Non-contact Biofield treatment; Surface area; Particle size; X-ray diffraction

Introduction

Electrical currents, along with their associated magnetic fields, can be found in the body [1].

A broad spectrum of radiant energies exists known as electromagnetic waves, ranging from the ultra-low, low, and infrared rays; all emanating from the human body. The peak intensity of the electromagnetic radiation of the human biofield is in the infrared region of the electromagnetic spectrum, in the range of 4 to 20 microns in wavelength.

Most of the radiation emitted by human body is in the infrared region, mainly at the wavelength of 12 micron. Additionally, Human skin is an almost perfect emitter of infrared radiation in the spectral region beyond 3 microns [2].

In this study, Aluminium Powder (150 Mesh) has been subjected to a non-contact biofield of Mr. Mahendra Trivedi, who is known to transform the characteristics of various living and non- living materials in controlled research experiments. The details of several scientific investigations and the results achieved through Biofield, in the areas of agriculture, Microbiology, Biotechnology including Material science, in the form of original data are reported elsewhere [3-18]. Biofield may act directly on molecular structures, changing the conformation of molecules in functionally significant ways.

The present paper reports the impact of Biofield on Aluminium powder, which is characterised by X-ray diffraction (XRD), specific surface area determination (BET) and Laser particle size analysis.

Experimental Section

Aluminium powder passing through 150 Mesh (MEPCO Ltd.) was selected for experiments. A number of sets of each powder were prepared; the first set that was untreated was designated as sample treated for 0 days while the other sets exposed to Biofield of Mr.Trivedi were identified by the number of days after treatment with Biofield. All the samples were characterized by specific surface area determination (BET), Laser particle size analysis and X-ray diffraction (XRD). Specific surface area determination was carried out on a SMART SORB 90 BET surface area analyzer with a measuring range of 0.2 to 1000 m^2/g.

Average particle size and size distribution were obtained using SYMPATEC HELOS-BF laser particle size analyzer with a detection range of 0.1 to 875 µm (micro meters). From the particle size distribution the volume percent of particles at specific particle size was noted and the results obtained on four separately treated powders were compared.

X-ray diffraction was carried out using a powder Phillips, Holland PW 1710 XRD system. A copper anode with nickel filter was used. The wavelength of the radiation was 1.54056 Å (10^{-10} m or 10^{-8} Cm). The data was obtained in the form of 2θ vs. Intensity chart as well as a detailed table containing 2θº, d value Å, peak width 2θº, peak intensity counts, relative Intensity %, etc. Observed 'd' values were compared

with standard JCPDS data base and the Miller Indices h, k and l for various $2\theta^o$ values were noted. The data were then analyzed using PowderX software to obtain lattice parameters and unit cell volume.

Results

Specific surface area

The specific surface area (s) of both untreated and treated powders as determined by BET technique is given in Table 1. Rationalization of the parameter is done by computing the percent change in specific surface area between untreated and treated powders $\Delta s\%=100*(s_t-s_0)/s_0$ .The linear variation of $\Delta s\%$ with time 't' in days after treatment with Biofield is shown in Figure 1. The specific surface area of treated powders decreases linearly at the rate of ~ 0.5% per day suggesting increasing rounding of the particles or joining of several particles into a large particle.

Characteristic	Number of Days After Treatment (t)	Surface area (s) m^2/g
BET Surface area (s) m2/g	0 (untreated)	0.21
	16	0.19
	98	0.092
	119	0.084
Percent Change in surface area between untreated and treated powders (Δs%)	0	
	16	-9.52
	98	-56.19
	119	-60.00

Table 1: Specific surface area (s) and Percent Change in specific surface area between untreated and treated aluminium powders (Δs%)

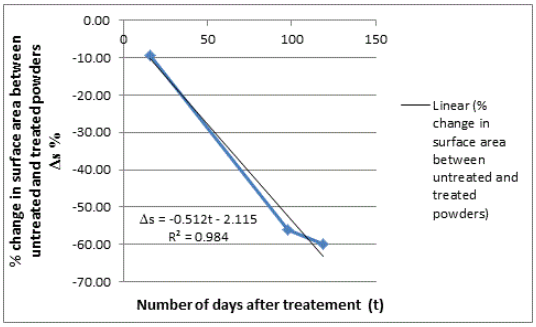


Figure 1 Variation in percent change in specific surface area between untreated and treated aluminium powders (Δs%) with time 't' after treatment. The decrease is linear and obeys the relation Δs = -0.512 t - 2.115

Particle size and size distribution

Particle size and particle size distribution was determined by laser particle size analyzer. From this data the particle size below which 10, 16, 50, 84, 90 and 99 percent of particles were present are noted for both untreated and samples treated for 11, 75, 83 and 112 days and given in Table 2. To understand whether coarser, or finer particles have changed on treatment, percent particles finer than average particle size in treated powders were evaluated using the relation $[100*(d_{50}- d_{10})/d_{10}]$. Similarly percent particles coarser than average particle size in treated powders were evaluated using the relation $[100*(d_{99}- d_{50})/d_{50}]$. These parameters are plotted as function of time't' in number of days after treatment and shown in Figure 2. The percentage increase in particles coarser than average particle size is much more than percentage increases in particles finer than average particle size. Thus, after about 80 day's treatment the percent of coarse particles are much larger than fine particles. This also could be the reason for the observed decrease in specific surface area.

Cumulative Percent Below (x)	Particle size micro meters (x) / Number of days after treatment 't'				
	0	11	75	83	112
10	37.68	43.94	25.73	26.58	27.95
16	45.78	51.5	31.54	32.72	34.46
50	75.92	79.76	57.23	62.42	65.08
84	114.88	118.59	93.08	110.75	108
90	127.89	133.27	104.03	127.48	123.77
99	199.34	211.47	142.24	198.89	271.29

Table 2: Particle size below which 10, 16, 50, 84, 90 and 99 percent of particles were present for both untreated and samples treated for 11, 75, 83 and 112 days.

Scanning Electron Microscopy

The powders were examined in a Scanning electron microscope (SEM). SEM pictures of both untreated and treated powders respectively are shown in Figure 3 (a) and (b). It is evident that on treatment a coarsening and rounding of particles had occurred. Internal boundaries where the particles got welded can be noticed in large particles.

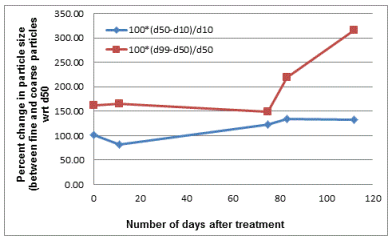
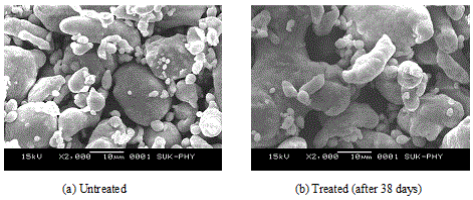


Figure 2: Variation in percent particles finer than average particle size as well as in percent particles coarser than average particle size in treated powders as function of time 't' in number of days after treatment. After 80 days the percent of coarse particles are much higher compared to percent of fine particles.



(a) Untreated (b) Treated (after 38 days)

Figure 3: Scanning electron microscope pictures of untreated and powders treated after 38 days showing a rounding, and coarsening of particles due to joining of several particles at inter particle boundaries.

X-ray diffraction

What must be happening to cause these significant changes in particle size and surface area? In order to find a probable cause the powders were examined by x ray diffraction.

Data analysis

Obtained 'd' values are compared with standard JCPDS data base and the Miller Indices h, k and l for various $2\theta^{o}$ values were noted. The data were then analyzed using PowderX software to obtain lattice parameters and unit cell volume.

The crystallite size was calculated using the formula,

Crystallite size = $k \lambda / b \cos \theta$ ..... (2)

Where, λ is the wavelength of x-radiation used (1.54056×10^{-10} m), 'b' is the peak width at half height, and k is the equipment constant with a value 0.94. The obtained crystallite size will be in Nano meters or 10^{-9} m. Crystallite size in metals can correspond to sub grain size when the grain size is equivalent to single crystal size. It is also possible that some part of the observed X- ray peak width could be due to the instrument broadening (already corrected) while the other part could be due to the strain in the crystal lattice.

The change between various powders was assessed by using relative parameters as follows;

Percent change in lattice parameter is the ratio of difference in the values between untreated and treated powders to the value of untreated powders expressed as percent. Typically for the parameter 'a' this is equal to 100^{*} ($\Delta a/a_c$) where $\Delta a=(a_t- a_c)/a_c$. This is also known as strain, and, when multiplied with the elastic modulus gives the force applied on the atoms. When the force is compressive the change is negative while a positive value indicates a stretching or tensile force. In a similar manner the percent change in unit cell volume and crystallite sizes were computed.

The weight of atom was computed from the sum of all electrons, protons and neutrons.

Weight of atom = number of protons × weight of proton + number of neutrons × weight of neutron + number of electrons × weight of electron

Since the number of atoms per unit cell of the crystal was known, the weight of the unit cell was computed. The latter divided by the volume of the unit cell gives the theoretical density. Since the volume of unit cell of the powder changes on treatment, the density as well as weight of atom will also change.

The weight of the atom when multiplied by the Avogadro's number (6.023×10^{23}) gives the atomic weight (M) or the weight of a gram atom of the substance. The ratio difference in atomic weight between untreated and treated samples to the atomic weight of untreated sample was then expressed as percent change in atomic weight. Typically this is same as 100 ($\Delta M/M_c$) where $\Delta M= (M_t- M_c)/M_c$. This value also represents the percent change in sum of weights of protons and neutrons in the nucleus.

The percent change in positive charge per unit volume was computed as follows;

The atomic radius was obtained by dividing the lattice parameter 'a' with 2. r=a/ 2

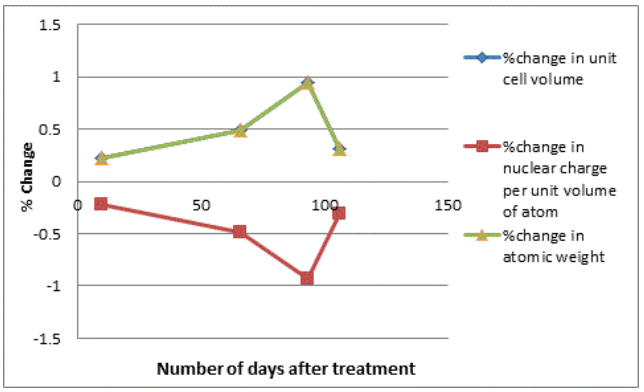


Figure 4: Variation in percent change in unit cell volume, atomic weight and percent change in nuclear charge per unit volume of atom. Percent change in both unit cell volume and atomic weight increased with increase in number of days after biofield treatment while percent change in nuclear charge per unit volume of atom decreased.

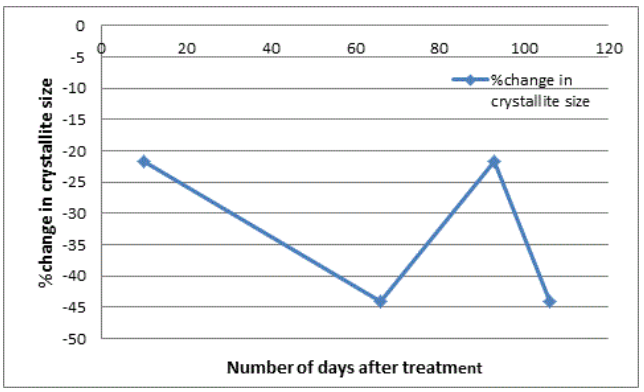


Figure 5: Variation in percent change in crystallite size with increase in number of days after biofield treatment. Increase in crystallite size is likely due to decreased nuclear charge and vice versa.

Then the volume of the atom was obtained by assuming it to be spherical $V=4 \pi r^3 /3$

The positive charge per unit volume of the atom was computed by multiplying the number of protons (p) in the atom with elementary charge 1.610^{-19} coulombs and then by dividing with the volume of the atom. The percent change in positive charge per unit volume ΔZ between untreated and treated powders was then obtained as

$\Delta Z\ \%=100\ (Zt^+ - Zc^+)/\ Zc^+$.

Results of XRD

The results of XRD obtained after data analysis are given in Table 3. Variation in percent change in unit cell volume and percent change in atomic weight with number of days after treatment showed an increase up to 93 days followed by a decrease (Figure 4). Percent nuclear charge per unit volume of atom showed exactly opposite variation. It initially decreased followed by a decrease after 93 days.

Figure 5 shows that percent change in crystallite size both increased and decreased with increase in number of days after treatment.

Discussion

Biofield treatment of aluminum powders had decreased the specific surface area by 60% in 119 days. This is possible only if the sharp corners and hills and valleys on the particle surfaces become plane and rounded. It is also possible that a number of small particles come together and welded by surface diffusion process (movement of atoms along and across surfaces cause surfaces to join). But these phenomena occur at one third of melting temperature which leads to the inference that exposure to Biofield causes heat energy in the powders.

The results of particle size of treated powders showed that the percent of coarser particles were much larger than the percent of finer particles thus inferring an increased average particle size. These results are also in agreement with increased surface area. The rounding and the increased size of the particles were seen in the scanning electron microscope pictures.

Characteristic	Number of days	Value of characteristic	Characteristic	Number of days	Value of characteristic
Lattice parameter 'a' x 10^{-8} cm	0	4.048	% Change in 'a' $\delta a\% = 100^* (a_t - a_c)/a_c$	0	0
	10	4.051		10	0.07
	66	4.054		66	0.16
	93	4.060		93	0.31
	106	4.052		106	0.10
Volume of unit cell X 10^{-24} cm	0	66.3	% Change in volume of unit cell $\delta v\% = 100^* (v_t - v_c)/v_c$	0	0
	10	66.5		10	0.22
	66	66.6		66	0.49
	93	66.9		93	0.94
	106	66.5		106	0.31
Crystallite size 'g' X 10^{-9} m	0	112.1	% Change in 'g' $\Delta g\% = 100^* (g_t - g_c)/g_c$	0	0
	10	87.6		10	-21.8
	66	62.6		66	-44.1
	93	87.6		93	-21.8
	106	62.6		106	-44.1
% Change in nuclear charge per unit volume of atom $\Delta z\ \% = 100^*(z_t^+ - z_c^+)/ z_c^+$	0	0	% Change in atomic weight $\Delta m\% = 100^* (m_t - m_c)/m_c$	0	0
	10	-0.22		10	0.22
	66	-0.49		66	0.49
	93	-0.93		93	0.94
	106	-0.31		106	0.31

Table 3: Variation in lattice constant, unit cell volume, crystallite size, atomic weight, and nuclear charge per unit volume.

X-ray diffraction of the powders showed that treatment with Biofield had increased the percent change in both unit cell volume and atomic weight while it decreased the percent change in nuclear charge per unit volume of atom. Decrease in nuclear charge per unit volume indicates increase in atomic volume or decrease in number of

positively charged protons. This reduced charge will attract the neighbouring atoms with lesser force thus increasing the unit cell and crystallite size as was observed in the present experiments. The interesting result observed in the present experiments is that the percent change in atomic weight is inversely proportional to percent change in nuclear charge per unit volume of atom and vice versa. This is only possible if protons are converted to neutrons and vice versa. That is bio energy mediates energy conversion to mass and mass conversion to energy through interchange of protons and neutrons.

Conclusions

Biofield exerted by Mr.Trivedi on aluminium metal powders had caused the following effects;

- The specific surface area of the treated powders had decreased with increase in number of days after treatment, which was also consistent with increased percent of coarser particles.
- Scanning electron microscopy indicated increase in size and roundness of particles thus justifying the observed decrease in surface area.
- Results of X-ray diffraction had showed that treatment with Biofield had increased the percent change in both unit cell volume and atomic weight while it decreased the percent change in nuclear charge per unit volume of atom. These results suggest that Biofield mediated energy conversion to mass and mass conversion to energy through interchange of protons and neutrons in the nucleus.

Acknowledgement

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