Applied Physics Research; Vol. 6, No. 4; 2014
ISSN 1916-9639 E-ISSN 1916-9647
Published by Canadian Center of Science and Education

A Form of Gravitation is Induced During Doping Exercise

Akande Raphael Oluwole[1]

[1] Theoretical Physics Group, University of Ibadan, Ibadan, Nigeria

Correspondence: Akande Raphael Oluwole, Theoretical Physics Group, University of Ibadan, Ibadan, Nigeria. Tel: 234-813-159-7032. E-mail: raphaelakande@myashiritycode.com

Received: June 10, 2014 Accepted: June 29, 2014 Online Published: July 8, 2014

doi:10.5539/apr.v6n4p83 URL: http://dx.doi.org/10.5539/apr.v6n4p83

Abstract

The doping exercise has been known to affect the electronic properties of semiconductor materials. However, little is known about the mystery behind what is exactly responsible for this doping effect. In this paper, we report our theoretical findings about a form of gravitation within the lattice and how it can be said to be induced or even responsible for the doping effect. We have observed that the lattice is being grouped into bands of energies by this form of gravitation. We have identified two major types: a-core and a-core-less. It is this form of gravitation that is actually responsible for the selection (or rejection) of atoms into (or from) a band. Hence, we have found out that there seems to be a competition between the electronic effect and this form of gravitation whenever doping occurs. The dopant atom being an impurity atom will contribute to depopulating or populating the band it is located.

Keywords: gravity, semiconductor, lattice, energy bands, a-core, a-core-less, simulation

1. Introduction

Theories and researches about doping and dopant atoms are many and varied, but according to WideGap 2001 Conference, there is still a great interest in the wide band doping field. The WideGap2001 workshop, a large gathering of theoretical physicist, reveals that the difficulty in finding suitable shallow donors still remains. In the works of Bryan and Gamelin (2005), it is reported that a display of dopant population per nanocrystal is shown by an ensemble of doped nanocrystals. Futhermore, Walsh et al. (2013) provide a good table showing the concentration of electrons and holes with dopant atom. In this paper, we shall focus on our findings about the form of gravitation which we based on the attraction of less energetic particles to another that are more energetic. We do not discuss the popular quantum gravity theory. However, we shall not only discuss the action of the form of gravitation while the molecules are forming but also after they have formed.

Doping is everywhere and acts everywhere in all materials either by premeditated intentions or by natural effects. The subsequent effect results in the new material transforming, each time it is doped, into another, completely or slightly different, new material. This is the origin of the great complexity that our universe is into now.

It is now, therefore, a matter of necessity to investigate the behavior of the new material as a result of the presence of its latest addition. In an attempt to do this we provide an assumption for some two types of behaviors the lattice, hosting the latest addition might take: a-core and a-core-less. Our scope of application of this idea extends from the smallest molecules up to the very big galaxies.

2. Methodology

2.1 Energetic Atoms

At any instance of time and at any point in space, an energetic particle is always a center of attraction for less energetic particles. This is the basic idea behind this paper. Since it has enough energy, it pulls other less energetic particles to itself (Giacomini & Neukirch, N.D.; Kolomietz, 2011). At the first instance of attraction, it shares (actually spends) its energy with (on) them to attract them.

$$\overline{E}_c = E_c - \sum_{i=1}^{n} E_{ic} \approx 0 \quad (1)$$

Where E_c is the energy of the center-most atom (we shall not consider a case where we have a group of atoms as the center-most particle) at the very first instance, and E_{ic} are the energies of each of the atoms being attracted.

Equation (1) ensures that almost all the energy of the center-most atom is spent in attracting the surrounding atoms (during interaction) and that only $\bar{E}_c$ is left.

It is worth noting that by equation (2) below, the least energetic atoms of the surrounding, attracted, atoms will receive the largest share of the E_c.

$$x_i = \frac{\left(E_c - E_i\right) - \left(\frac{(n-1)Ec}{n}\right)}{\exp\left(\Lambda_{ic}\right)}, n \neq 0 \tag{2a}$$

Where

$$\Lambda_{ic} = \frac{1}{\left[a^{\dagger} + \sin\left(2\pi\left(\frac{b^{\dagger}}{4}\right)\right)^2\right] + \left[a^{\dagger} + \cos\left(2\pi\left(\frac{b^{\dagger}}{2}\right)\right)^2\right]} \tag{2b}$$

Where $a^{\dagger}$ and $b^{\dagger}$ are the operators for checking the charge and spin of two particles respectively. For application, we shall make use of something like $e^{-\Lambda_{ic}}$.

With the above (2b), we can have this chart:

Table 1. Spin-charge parameters for interacting particles

Symbol	Value	$a^{\dagger}$	$b^{\dagger}$
$\Lambda^{++}_{\uparrow\uparrow}$ or $\Lambda^{++}_{\downarrow\downarrow}$	1	0	0
$\Lambda^{--}_{\uparrow\uparrow}$ or $\Lambda^{--}_{\downarrow\downarrow}$	1	0	0
$\Lambda^{--}_{\uparrow\downarrow}$	$\frac{1}{2}$	0	1
$\Lambda^{++}_{\uparrow\downarrow}$	$\frac{1}{2}$	0	1
$\Lambda^{+-}_{\uparrow\downarrow}$	$\frac{1}{4}$	1	1
$\Lambda^{+-}_{\downarrow\downarrow}$ or $\Lambda^{+-}_{\uparrow\uparrow}$	$\frac{1}{3}$	1	0

2.2 Gravitation

Subsequently, in return, the backward flow of energy from the attracted to the center-most is now the sum of the energies of the attracted and that of the center-most. The idea is best illustrated with the Table 2 below:

Table 2. Overall gradual reduction in gravitation as molecules build up

Time,t /arb. unit	Center-most	Immediate ring of atoms	Next ring	Next ring
0	E_c	0	0	0
1	$E_c \approx 0$	$E_c + \sum_{i=1}^{n} E_{n_i c}$	0	0
2	$E_c + \sum_{i=1}^{n} E_{n_i c}$	$E_c + \sum_{i=1}^{n} E_{n_i c} \approx 0$	$\sum_{j=1}^{m} E_{m_j c}$	0
3	$E_c + \sum_{i=1}^{n} E_{n_i c} \approx 0$	$E_c + \sum_{i=1}^{n} E_{n_i c} + \sum_{j=1}^{m} E_{n_j c}$	$\sum_{j=1}^{m} E_{m_j c} \approx 0$	$\sum_{k=1}^{p} E_{p_k c}$

The Table 2 above illustrates how a band (of atoms) of energy is formed around an energetic center-most particle E_c. When the time t=0, in the table above, only the center-most atom is present. Its presence calls for a (or some)

much less energetic particle(s). The movement of those less energetic atoms towards E_c makes E_c throw off its energy onto them. As those, previously, less energetic particles become energetic, they also attract more of less energetic particles. Then the cycle goes on until the energy transferred to the center-most atom becomes too much to bear. We shall give details shortly.

At time t=3, there are three rings of varying number of atoms (the fourth ring or column in Table 2 is populated because the 3rd ring had attracted atoms into the fourth ring at t=2): the center-most, immediate less energetic and next immediate less energetic atoms. However, out of these three rings, only the center-most is the (most) less energetic at t=3. Please note the word "most" which is to compare the levels of energies of the center-most and the next two rings. Note that at t=3, just two rings have energies close to zero and they are the center-most and the next immediate less energetic atoms. Out of these two rings of atoms, the center-most is more (potentially) energetic due to the fact that its previous potential of energy is higher than the next immediate less energetic atoms.

An outer-most atom is attracted much the same way it is said of creation of particles (Coleman, 2011; Mandl, 1992). An example is the creation of the fourth ring or column in Table 2 which is populated because the 3rd ring had attracted atoms into the fourth ring at t=2:

$$E_c - \sum_{i=1}^{n} E_{n_i c} = \sum_{i=1}^{n} E_{n_i c} \Rightarrow E_c - \sum_{i=1}^{n} E_{n_i c} = \varsigma^{\dagger} \left| n_i \right\rangle \tag{3}$$

Thus the Figure 1 below shows the energy flow and population of an energy band:

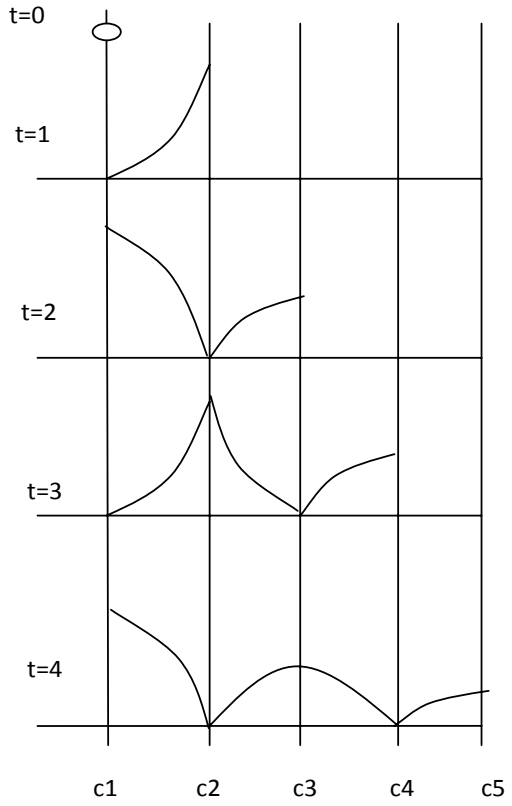

Figure 1. Illustration of energy flow and population of an energy band

The following sets of equations (4) and (5) (Riley, Hobson, & Bence, 2002; Landau, Páez, & Bordeianu, 2007) will be used to describe the behavior or pattern of the population of the atoms as given in Table 2.

$$f(\tau) = \left| \sqrt{\frac{2}{\pi}} \left(\frac{\sin(\tau\rho)}{\tau} \right) \right| \tag{4}$$

$$f'(\tau) = \left|\sqrt{\frac{2}{\pi}}\left(\frac{\tau\rho\cos(\tau\rho) - \sin(\tau\rho)}{\tau^2}\right)\right| \tag{5}$$

In order to provide a dynamic flow of transfer of energy as in figure 1 above, we have:

$$\bar{f}(\tau, t_{odd}, t_{even}) = 1 - f(\tau)^{t_{odd}} - f'(\tau)^{t_{even}} \tag{6}$$

The act of populating the group (or band) of atoms this way in which energy keeps moving towards the center of attraction is what we have called "a form of gravitation".

In order to apply equations (4) and (5) to the gravitation of energy, we have:

$$f(\tau) = \bar{f}(\tau, t_{odd}, t_{even})\left(\frac{\sin(\tau\rho)}{\tau}\right) \text{ and } f'(\tau) = \bar{f}(\tau, t_{odd}, t_{even})\left(\frac{\tau\rho\cos(\tau\rho) - \sin(\tau\rho)}{\tau^2}\right).$$

The instantaneous energies of each of the participating rings of atoms in the dynamic flow of transfer of energy towards the center can be written as:

$$\tilde{f}_{grav}(E,t) = \begin{pmatrix} E_{c0} & 0 & 0 & 0 & 0 & 0 & \cdots & \cdots & \cdots \\ 0 & E_{c1} & 0 & 0 & 0 & 0 & & & \\ E_{c0} & 0 & E_{c2} & 0 & 0 & 0 & & & \\ 0 & E_{c1} & 0 & E_{c3} & 0 & 0 & & & \\ E_{c0} & 0 & E_{c2} & 0 & E_{c4} & 0 & & & \\ 0 & E_{c1} & 0 & E_{c3} & 0 & E_{c5} & & & \\ \vdots & & & & & & \ddots & & \\ \vdots & & & & & & & \ddots & \\ \vdots & & & & & & & & \end{pmatrix} \otimes \begin{pmatrix} t_0 \\ t_1 \\ t_2 \\ t_3 \\ t_4 \\ t_5 \\ \vdots \\ \vdots \\ \vdots \end{pmatrix} = \begin{pmatrix} E_{c0}^0 & & \cdots & \cdots \\ E_{c0}^0 + E_{c1}^0 & & & \\ E_{c0}^0 + E_{c1}^0 & E_{c2}^2 & & \\ E_{c0}^0 + E_{c1}^0 + E_{c2}^2 & E_{c3}^3 & & \\ E_{c0}^0 + E_{c1}^0 + E_{c2}^2 & E_{c3}^3 & E_{c4}^4 & \\ E_{c0}^0 + E_{c1}^0 + E_{c2}^2 + E_{c3}^3 & E_{c4}^4 & E_{c5}^5 & \\ \vdots & & \ddots & \\ \vdots & & & \ddots \\ \vdots & & & \end{pmatrix} \tag{7}$$

We can rewrite (7) as:

$$\tilde{f}_{grav}(E,t) = E_{ring-number} \otimes t = E^{time}_{ring-number} \tag{7a}$$

In equation (6), the single column time matrix is used together with the operator $\otimes$ to map both matrices on the left and right hands of the equation in a "ring-to-one" mode. This means, for instance, that the total energy at ring 3, at t=5, is E_{c4}^4. Where E_{c4}^4 carries the labeling $E^{time}_{ring-number}$. Hence, the number of active (non-zero) columns along the rows of $E_{ring-number}$ is the same as the number of active columns in $E^{time}_{ring-number}$. This provides a very easy way of checking the energies of each atom in the band and the characteristic energies of any band of atoms.

2.3 a-core

In this case, we shall label some groupings (bands) of atoms as being a-core(d). This simply means their center-most particle is just a single atom. Again, we shall not discuss a situation where their center-most region is a bundle of atoms, however, in short while, we shall discuss a situation where the center-most region is empty.

Of course, as the number of the surrounding particles (i.e atoms) grows, the center-most atom becomes unable to accommodate them any further. This inability to further accommodate is obviously due to the growth of the "recalled" or "gravitating" energy (flowing towards the center and) acting on the center-most atom as the number of the attracted atoms grows. The effect of the recalled energy on the center-most is to keep exciting its electrons against the nucleus and get the electrons always getting closer to the nucleus. At the point where the electrons cannot go further to the nucleus, the number of attracted atoms stops and a band or molecule of atoms is formed.

For the simplest of cases, we can impose a principle (to implement a restriction): that no net energy on a center-most atom should exceed its binding energy, Θ_{c0} (Kolomietz, 2011). This way we present our principle by employing the imaginary part of an oscillation equation. This is because there is very high probability that there exists an oscillation of the number of particles before a final number is fixed. So we have:

$$\eta_{ac} = \tanh\left(\Theta_{c0} - \frac{1}{\Theta_{c0}\exp\left(-\tilde{f}_{grav}\left(E_{c0}, E_{c0}^{t}, t\right)\right) - \upsilon\exp\left(-\tilde{f}_{grav}\left(E_{c0}, E_{c0}^{t}, t\right)\right)}\right) \tag{8a}$$

$$\eta_{ac} = \tanh\left(\Theta_{c0} - \frac{1}{\left(\Theta_{c0} - \upsilon\right)\exp\left(-\tilde{f}_{grav}\left(E_{c0}, E_{c0}^{t}, t\right)\right)}\right) \tag{8b}$$

Where $\frac{1}{2}\sqrt{\frac{-\phi^{\dagger}\phi\sqrt{m\omega} - i4m\omega\left(\xi + \zeta\right)}{\left(m\omega\right)^{3/2}}}, \omega = \left(\frac{1}{\left(\frac{\left(x_i - 1\right)^{2\delta_{ij}}}{\left(-\frac{1}{4}\right)\left(\coth\bar{x}_i\right)^{2\delta_{ij}-1}}\right)}\right), \varpi = \frac{\phi^{\dagger}\phi}{m}, \bar{x}_i = \frac{x_i}{x_i - 1}$ (9a-d)

Where $\phi^{\dagger}\phi$ is the incoming or outgoing photon at any instance, m is the mass of the particle,

$\xi = e^{-\Lambda}$, $\omega = -\left(\frac{4}{\left(x_i - 1\right)^{2\delta_{ij}}\left(\coth\bar{x}\right)^{2\delta_{ij}-1}}\right)$, and ζ is the net external influences.

The η_{ac} is the quantity which determines the probability that the current (total) energy of the center most atom is close to or less than its binding energy. Hence, η_{ac} can only be 1 or 0.

Rewriting equation (3) with the principle imposed, the number atoms that will be attracted are given as:

$$n_c = \overset{\infty}{\underset{c=1}{\otimes}}\left(\zeta_{ac,c}^{\dagger}\right)^{\Delta_{ij}}\left|0\right\rangle_c \tag{10}$$

Where $\Delta_{ij} = 0$, if $\eta_{ac} = 1$ and $\Delta_{ij} = 1$, if $\eta_{ac} < 1$.

$\zeta_{ac,c}^{\dagger}$ is the (a-core type) operator for creating more particles into states $\left|0\right\rangle_c$ along rings c.

2.4 a-core-less

As for the a-core-less group or band of atoms, the region is empty as said before. This means that there is limitless number of atoms to be attracted since, our principle is inapplicable due to lack of binding energy for the center. Therefore, equation (9) cannot be applied to an a-core-less band of atoms. The equation (10) would also be modified as given below for a-core-less:

$$n_c = \overset{\infty}{\underset{c=1}{\otimes}}\left(\zeta_{ac1,c}^{\dagger}\right)\left|0\right\rangle_c \tag{11}$$

$\zeta_{ac1,c}^{\dagger}$ is the (a-core-less type) operator for creating more particles into states $\left|0\right\rangle_c$ along rings c.

Basically, $\zeta_{ac,c}^{\dagger}$ and $\zeta_{ac1,c}^{\dagger}$ are the same except for how they are applied.

2.5 Gravitation at Close Energies

"Gravitation at close energies" is a term to describe how afore mentioned form of gravitation continues to operate at slightly different energies. This type of energies is a feature of already formed molecule. We shall employ the shape of electric charge field around same and opposite charges to model the spin interactions of these charged particles. We are focusing on the spin interaction because it is now the most likely means of transporting energy at such low energies.

Before we go on, we shall define some algebrae which are to be frequently used in our subsequent discussions:

Starting with the Pauli spin matrices (Coleman, 2011; Mandl, 1992), we have:

$$\sigma_x = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}, \sigma_y = \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}, \sigma_z = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix} \tag{12}$$

We can transform each of the above into another using the following tricks:

$$\sigma_z = i\sigma_y\sigma_x = i\begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \tag{13}$$

$$\sigma_z = i\sigma_y\sigma_x = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix} \tag{14}$$

Similarly,

$$\sigma_x = -i\sigma_y\sigma_z \quad \text{and} \quad \sigma_y = i[\sigma_z\sigma_x]^T \tag{15}$$

We should also note that, for instance, $\sigma_y\sigma_x \neq \sigma_x\sigma_y$

$$i\sigma_x\sigma_y = i\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}\begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix} \tag{16}$$

$$i\sigma_x\sigma_y = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} \tag{17}$$

This leads to non-commutative algebra which we shall soon mention along the line. Now, we obtain the commutativity of the following:

$$i[\sigma_y, \sigma_x] = i(\sigma_y\sigma_x - \sigma_x\sigma_y) = 2\sigma_z \tag{18},$$

Similarly,

$$-i[\sigma_y, \sigma_z] = -i(\sigma_y\sigma_z - \sigma_z\sigma_y) = 2\sigma_x \tag{19},$$

and

$$i[\sigma_z, \sigma_x] = i(\sigma_z\sigma_x - \sigma_x\sigma_z) = 2(\sigma_y)^T \tag{20}$$

We shall now, discuss a method of analyzing the interactions of these 2x2 Pauli matrices when they are built up into a 3x3 matrix. This method is actually a form of operation performed on these groups of Pauli matrices. The operation is as follows:

Given a 3x3 matrix A, taken from a universal matrix (representing the lattice) ψ such that its elements are mapped 1-1 into a Pauli matrix each as:

$$A = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix} \rightarrow \begin{pmatrix} \sigma_i & \sigma_i & \sigma_i \\ \sigma_i & \sigma_i & \sigma_i \\ \sigma_i & \sigma_i & \sigma_i \end{pmatrix} \tag{21}$$

We focus on rectangular lattice and define an array of boxes where μ (the four sides) and $\hat{\omega}$ (each box) are as shown below. The μ line will pass through the space between the matrix elements.

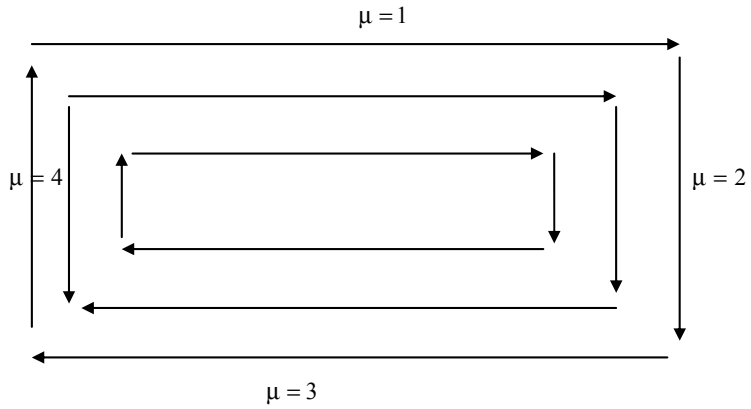

Figure 2. Rectangular (lattice) box for illustrating the movement of gravitating particles

For when $\mu = 1, \hat{\omega} = 1$

$$A^{\dagger}\psi = \sum_{\rho=1}^{3} \Lambda_{\rho}\xi\left(a_{\lambda,e,\sigma}\right)\Omega\left(a_{\Delta}\right)\mathrm{I}_3$$

$$\therefore \bigotimes_{\lambda=1}^{n-4} A_{\mu\lambda}^{\dagger}\psi = \bigotimes_{\lambda=1}^{n-4} \sum_{\rho=1}^{3} \Lambda_{\rho}\xi\left(a_{\lambda,e,\sigma}\right)\Omega^{\mathrm{T}}\left(a_{\Delta}\right)\mathrm{I}_3$$

We write operators (Landau, Páez, & Bordeianu, 2007) as:

$$\therefore \bigotimes_{\lambda=1}^{n-4} A_{\mu\lambda}^{\dagger}\psi = \bigotimes_{\lambda=1}^{n-4} \varepsilon^{\dagger}\left\langle \xi\left(a_{\lambda,e,\sigma}\right) \mid \Omega^{\mathrm{T}}\left(a_{\Delta}\right)\right\rangle \tilde{\varepsilon} \tag{22}$$

Where
$$\Lambda_1 = \begin{pmatrix} 1 & 1 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}, \Lambda_2 = \begin{pmatrix} 0 & 0 & 0 \\ 1 & 1 & 1 \\ 0 & 0 & 0 \end{pmatrix}, \Lambda_3 = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 1 & 1 & 1 \end{pmatrix} \tag{23a-c}$$

Also
$$\mathrm{I}_3 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \text{and } \mathrm{I}_2 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \tag{24a-b}$$

Also, $\mathrm{I}_3 \equiv \tilde{\varepsilon}$ and $\mathrm{I}_2 \equiv \tilde{\delta}$

For when $\mu = 2, \hat{\omega} = 1$

$$A^{\dagger}\psi = \sum_{\rho=1}^{3} \Lambda_{\rho}\xi^{\mathrm{T}}\left(a_{\lambda,e,\sigma}\right)\Omega\left(a_{\bar{\Delta}}\right)\mathrm{I}_3$$

$$\therefore \bigotimes_{\lambda=1}^{n-4} A_{\mu\lambda}^{\dagger}\psi = \bigotimes_{\lambda=1}^{n-4} \sum_{\rho=1}^{3} \Lambda_{\rho}\xi^{\mathrm{T}}\left(a_{\lambda,e,\sigma}\right)\Omega\left(a_{\bar{\Delta}}\right)\mathrm{I}_3$$

$$\therefore \bigotimes_{\lambda=1}^{n-4} A_{\mu\lambda}^{\dagger}\psi = \bigotimes_{\lambda=1}^{n-4} \varepsilon^{\dagger}\left\langle \xi^{\mathrm{T}}\left(a_{\lambda,e,\sigma}\right) \mid \Omega\left(a_{\bar{\Delta}}\right)\right\rangle \tilde{\varepsilon} \tag{25}$$

For when $\mu = 3, \bar{\omega} = 1$

$$A^{\dagger}\psi = \sum_{\rho=1}^{3} \Lambda_{\rho} \xi\left(a_{\lambda,e,\sigma}\right) \Omega^{\mathrm{T}}\left(a_{\bar{\Delta}}\right) \mathrm{I}_3$$

$$\therefore \bigotimes_{\lambda=1}^{n-4} A_{\mu\lambda}^{\dagger}\psi = \bigotimes_{\lambda=1}^{n-4} \sum_{\rho=1}^{3} \Lambda_{\rho} \xi\left(a_{\lambda,e,\sigma}\right) \Omega^{\mathrm{T}}\left(a_{\bar{\Delta}}\right) \mathrm{I}_3$$

$$\therefore \bigotimes_{\lambda=1}^{n-4} A_{\mu\lambda}^{\dagger}\psi = \bigotimes_{\lambda=1}^{n-4} \varepsilon^{\dagger} \left\langle \xi\left(a_{\lambda,e,\sigma}\right) \mid \Omega^{\mathrm{T}}\left(a_{\bar{\Delta}}\right) \right\rangle \tilde{\varepsilon} \tag{26}$$

For when $\mu = 4, \bar{\omega} = 1$

$$A^{\dagger}\psi = \sum_{\rho=1}^{3} \Lambda_{\rho} \xi^{\mathrm{T}}\left(a_{\lambda,e,\sigma}\right) \Omega\left(a_{\Delta}\right) \mathrm{I}_3$$

$$\therefore \bigotimes_{\lambda=1}^{n-4} A_{\mu\lambda}^{\dagger}\psi = \bigotimes_{\lambda=1}^{n-4} \sum_{\rho=1}^{3} \Lambda_{\rho} \xi^{\mathrm{T}}\left(a_{\lambda,e,\sigma}\right) \Omega\left(a_{\Delta}\right) \mathrm{I}_3$$

$$\therefore \bigotimes_{\lambda=1}^{n-4} A_{\mu\lambda}^{\dagger}\psi = \bigotimes_{\lambda=1}^{n-4} \varepsilon^{\dagger} \left\langle \xi^{\mathrm{T}}\left(a_{\lambda,e,\sigma}\right) \mid \Omega\left(a_{\Delta}\right) \right\rangle \tilde{\varepsilon} \tag{27}$$

The matrix A may also be broken into 4 parts as:

For when $\mu = 1, \bar{\omega} = 1$

$$B_1 = \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix} \rightarrow \begin{pmatrix} \sigma_i & \sigma_i \\ \sigma_i & \sigma_i \end{pmatrix} \tag{28}$$

$$B_{1\lambda} = \bigotimes_{\gamma=1}^{4} \sum_{\rho=1}^{2} \Lambda_{\rho} \xi_{\rho}\left(a_{\lambda,e,\sigma}\right) \Omega_{\rho}^{\mathrm{T}}\left(a_{\Delta}\right) \mathrm{I}_2$$

$$\therefore \bigotimes_{\lambda=1}^{n-4} B_{\lambda\gamma}^{\dagger} A_{\mu\lambda}^{\dagger}\psi = \bigotimes_{\lambda=1}^{n-4} \bigotimes_{\gamma=1}^{4} \sum_{\beta=1}^{2} \Lambda_{\beta} \sum_{\alpha}^{3} \Lambda_{\alpha} \xi_{\alpha\beta}\left(a_{\lambda,e,\sigma}\right) \Omega_{\alpha\beta}^{\mathrm{T}}\left(a_{\Delta}\right) \mathrm{I}_{\alpha} \mathrm{I}_{\beta}$$

$$\therefore \bigotimes_{\lambda=1}^{n-4} B_{\lambda\gamma}^{\dagger} A_{\mu\lambda}^{\dagger}\psi = \bigotimes_{\lambda=1}^{n-4} \bigotimes_{\gamma=1}^{4} \delta^{\dagger} \varepsilon^{\dagger} \left\langle \xi_{\alpha\beta}\left(a_{\lambda,e,\sigma}\right) \mid \Omega_{\alpha\beta}^{\mathrm{T}}\left(a_{\Delta}\right) \right\rangle \tilde{\varepsilon} \tilde{\delta} \tag{29}$$

For when $\mu = 2, \bar{\omega} = 1$

$$B_2 = \begin{pmatrix} a_{12} & a_{13} \\ a_{22} & a_{23} \end{pmatrix} \rightarrow \begin{pmatrix} \sigma_i & \sigma_i \\ \sigma_i & \sigma_i \end{pmatrix}$$

$$B_{2\lambda} = \bigotimes_{\gamma=1}^{4} \sum_{\rho=1}^{2} \Lambda_{\rho} \xi_{\rho}^{\mathrm{T}}\left(a_{\lambda,e,\sigma}\right) \Omega_{\rho}\left(a_{\bar{\Delta}}\right) \mathrm{I}_2$$

$$\therefore \bigotimes_{\lambda=1}^{n-4} B_{\lambda\gamma}^{\dagger} A_{\mu\lambda}^{\dagger}\psi = \bigotimes_{\lambda=1}^{n-4} \bigotimes_{\gamma=1}^{4} \sum_{\beta=1}^{2} \Lambda_{\beta} \sum_{\alpha}^{3} \Lambda_{\alpha} \xi_{\alpha\beta}^{\mathrm{T}}\left(a_{\lambda,e,\sigma}\right) \Omega_{\alpha\beta}\left(a_{\bar{\Delta}}\right) \mathrm{I}_{\alpha} \mathrm{I}_{\beta}$$

$$\therefore \bigotimes_{\lambda=1}^{n-4} B_{\lambda\gamma}^{\dagger} A_{\mu\lambda}^{\dagger}\psi = \bigotimes_{\lambda=1}^{n-4} \bigotimes_{\gamma=1}^{4} \delta^{\dagger} \varepsilon^{\dagger} \left\langle \xi_{\alpha\beta}^{\mathrm{T}}\left(a_{\lambda,e,\sigma}\right) \mid \Omega_{\alpha\beta}\left(a_{\bar{\Delta}}\right) \right\rangle \tilde{\varepsilon} \tilde{\delta} \tag{30}$$

For when $\mu = 3, \bar{\omega} = 1$

$$B_3 = \begin{pmatrix} a_{21} & a_{22} \\ a_{31} & a_{32} \end{pmatrix} \rightarrow \begin{pmatrix} \sigma_i & \sigma_i \\ \sigma_i & \sigma_i \end{pmatrix}$$

$$B_{3\lambda} = \overset{4}{\underset{\gamma=1}{\otimes}} \sum_{\rho=1}^{2} \Lambda_\rho \xi_\rho \left(a_{\lambda,e,\sigma}\right) \Omega_\rho^{\mathrm{T}} \left(a_{\bar{\Delta}}\right) \mathrm{I}_2$$

$$\therefore \overset{n-4}{\underset{\lambda=1}{\otimes}} B_{\lambda\gamma}^{\dagger} A_{\mu\lambda}^{\dagger} \psi = \overset{n-4}{\underset{\lambda=1}{\otimes}} \overset{4}{\underset{\gamma=1}{\otimes}} \sum_{\beta=1}^{2} \Lambda_\beta \sum_{\alpha}^{3} \Lambda_\alpha \xi_{\alpha\beta} \left(a_{\lambda,e,\sigma}\right) \Omega_{\alpha\beta}^{\mathrm{T}} \left(a_{\bar{\Delta}}\right) \mathrm{I}_\alpha \mathrm{I}_\beta$$

$$\therefore \overset{n-4}{\underset{\lambda=1}{\otimes}} B_{\lambda\gamma}^{\dagger} A_{\mu\lambda}^{\dagger} \psi = \overset{n-4}{\underset{\lambda=1}{\otimes}} \overset{4}{\underset{\gamma=1}{\otimes}} \delta^{\dagger} \varepsilon^{\dagger} \left\langle \xi_{\alpha\beta} \left(a_{\lambda,e,\sigma}\right) \mid \Omega_{\alpha\beta}^{\mathrm{T}} \left(a_{\bar{\Delta}}\right) \right\rangle \tilde{\varepsilon} \tilde{\delta} \tag{31}$$

For when $\mu = 4, \bar{\omega} = 1$

$$B_4 = \begin{pmatrix} a_{22} & a_{23} \\ a_{32} & a_{33} \end{pmatrix} \rightarrow \begin{pmatrix} \sigma_i & \sigma_i \\ \sigma_i & \sigma_i \end{pmatrix}$$

$$B_{4\lambda} = \overset{4}{\underset{\gamma=1}{\otimes}} \sum_{\rho=1}^{2} \Lambda_\rho \xi_\rho^{\mathrm{T}} \left(a_{\lambda,e,\sigma}\right) \Omega_\rho \left(a_\Delta\right) \mathrm{I}_2$$

$$\therefore \overset{n-4}{\underset{\lambda=1}{\otimes}} B_{\lambda\gamma}^{\dagger} A_{\mu\lambda}^{\dagger} \psi = \overset{n-4}{\underset{\lambda=1}{\otimes}} \overset{4}{\underset{\gamma=1}{\otimes}} \sum_{\beta=1}^{2} \Lambda_\beta \sum_{\alpha}^{3} \Lambda_\alpha \xi_{\alpha\beta}^{\mathrm{T}} \left(a_{\lambda,e,\sigma}\right) \Omega_{\alpha\beta} \left(a_\Delta\right) \mathrm{I}_\alpha \mathrm{I}_\beta$$

$$\therefore \overset{n-4}{\underset{\lambda=1}{\otimes}} B_{\lambda\gamma}^{\dagger} A_{\mu\lambda}^{\dagger} \psi = \overset{n-4}{\underset{\lambda=1}{\otimes}} \overset{4}{\underset{\gamma=1}{\otimes}} \delta^{\dagger} \varepsilon^{\dagger} \left\langle \xi_{\alpha\beta}^{\mathrm{T}} \left(a_{\lambda,e,\sigma}\right) \mid \Omega_{\alpha\beta} \left(a_\Delta\right) \right\rangle \tilde{\varepsilon} \tilde{\delta} \tag{32}$$

Now, we further introduce yet another operator $S^{\dagger}$ (which we shall call its products, Akande Matrices for the purpose of distinguishing them from others) which performs our new operation on the elements of B which are elements undergoing a Pauli matrix spin. This operator produces spin interacting matrices.

We introduce an example of the application of operator $S^{\dagger}$ as:

$$S^{\dagger} B^{\dagger} A^{\dagger} \psi = \begin{pmatrix} \sigma_{i1} & \sigma_{i2} + \sigma_{j1} & \sigma_{j2} \\ \sigma_{i3} + \sigma_{k1} & \sigma_{i4} + \sigma_{k2} + \sigma_{j3} + \sigma_{l1} & \sigma_{j4} + \sigma_{l2} \\ \sigma_{k3} & \sigma_{k4} + \sigma_{l3} & \sigma_{l4} \end{pmatrix} \tag{33}$$

Where $\sigma_{i4}, \sigma_{k2}, \sigma_{j3}, \sigma_{l1}$ are 4th, 2nd, 3rd and 1st elements of the Pauli matrices i, j, k and l respectively.

We shall not consider a negative orientation of the Pauli matrices.

The basic ideas for listing the operator above are:

(1) The atoms are interacting in negative directions against each other's fields. An example is illustrated by the Figure 3 below. Note that the way it occurs for charge is slightly different for spin interactions.

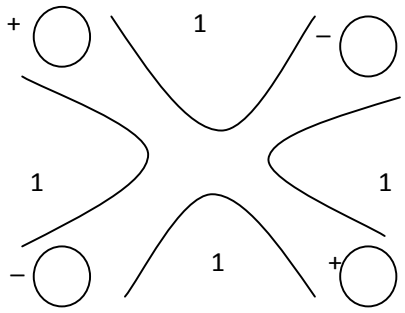

Figure 3. Atoms are interacting in negative directions against each other's fields

(2) This results in a buildup of "common" field at the center of the interaction,

(3) From the 3x3 matrix representation of spin, we have suggested this idea,

(4) The spin of a particle is a truly intrinsic physical property and cannot be altered in any known way.

(5) The spin represents the lowest possible energy state of any particle and it is the means by which particles interact as their energy differences approaches zero.

It is important to note that we can have the operation of $S^{\dagger}$ in 81 (basis matrices) unique ways.

So we have:

For when $\mu = 1, \bar{\omega} = 1$

$$S_{\lambda\gamma}^{\dagger} \overset{n-4}{\underset{\lambda=1}{\otimes}} B_{\lambda\gamma}^{\dagger} A_{\mu\lambda}^{\dagger} \psi = \frac{1}{\eta} \sum_{s=1}^{81} S_{\lambda\gamma}^{\dagger} \overset{n-4}{\underset{\lambda=1}{\otimes}} \overset{4}{\underset{\gamma=1}{\otimes}} \delta^{\dagger} \varepsilon^{\dagger} \left\langle \xi_{\alpha\beta}\left(a_{\lambda,e,\sigma}\right) \mid \Omega_{\alpha\beta}^{\mathrm{T}}\left(a_{\Delta}\right) \right\rangle \tilde{\varepsilon} \tilde{\delta}$$

$$S_{\lambda\gamma}^{\dagger} \overset{n-4}{\underset{\lambda=1}{\otimes}} B_{\lambda\gamma}^{\dagger} A_{\mu\lambda}^{\dagger} \psi = \frac{1}{\eta} \sum_{s=1}^{81} S_{\lambda\gamma}^{\dagger} \left\langle \delta^{\dagger} \varepsilon^{\dagger} \mid \xi_{\alpha\beta}\left(a_{\lambda,e,\sigma}\right) \mid \Omega_{\alpha\beta}^{\mathrm{T}}\left(a_{\Delta}\right) \mid \tilde{\varepsilon} \tilde{\delta} \right\rangle$$

$$S_{\lambda\gamma}^{\dagger} \overset{n-4}{\underset{\lambda=1}{\otimes}} B_{\lambda\gamma}^{\dagger} A_{\mu\lambda}^{\dagger} \psi = \frac{1}{\eta} \sum_{i=1}^{3} \sum_{j=1}^{3} \sum_{k=1}^{3} \sum_{l=1}^{3} S_{\lambda\gamma i\,jkl}^{\dagger} \left\langle \delta^{\dagger} \varepsilon^{\dagger} \mid \xi_{\alpha\beta}\left(a_{\lambda,e,\sigma}\right) \mid \Omega_{\alpha\beta}^{\mathrm{T}}\left(a_{\Delta}\right) \mid \tilde{\varepsilon} \tilde{\delta} \right\rangle \tag{34}$$

For when $\mu = 2, \bar{\omega} = 1$

$$S_{\lambda\gamma}^{\dagger} \overset{n-4}{\underset{\lambda=1}{\otimes}} B_{\lambda\gamma}^{\dagger} A_{\mu\lambda}^{\dagger} \psi = \frac{1}{\eta} \sum_{s=1}^{81} S_{\lambda\gamma}^{\dagger} \overset{n-4}{\underset{\lambda=1}{\otimes}} \overset{4}{\underset{\gamma=1}{\otimes}} \delta^{\dagger} \varepsilon^{\dagger} \left\langle \xi_{\alpha\beta}^{\mathrm{T}}\left(a_{\lambda,e,\sigma}\right) \mid \Omega_{\alpha\beta}\left(a_{\bar{\Delta}}\right) \right\rangle \tilde{\varepsilon} \tilde{\delta}$$

$$S_{\lambda\gamma}^{\dagger} \overset{n-4}{\underset{\lambda=1}{\otimes}} B_{\lambda\gamma}^{\dagger} A_{\mu\lambda}^{\dagger} \psi = \frac{1}{\eta} \sum_{s=1}^{81} S_{\lambda\gamma}^{\dagger} \left\langle \delta^{\dagger} \varepsilon^{\dagger} \mid \xi_{\alpha\beta}^{\mathrm{T}}\left(a_{\lambda,e,\sigma}\right) \mid \Omega_{\alpha\beta}\left(a_{\bar{\Delta}}\right) \mid \tilde{\varepsilon} \tilde{\delta} \right\rangle$$

$$S_{\lambda\gamma}^{\dagger} \overset{n-4}{\underset{\lambda=1}{\otimes}} B_{\lambda\gamma}^{\dagger} A_{\mu\lambda}^{\dagger} \psi = \frac{1}{\eta} \sum_{i=1}^{3} \sum_{j=1}^{3} \sum_{k=1}^{3} \sum_{l=1}^{3} S_{\lambda\gamma i\,jkl}^{\dagger} \left\langle \delta^{\dagger} \varepsilon^{\dagger} \mid \xi_{\alpha\beta}^{\mathrm{T}}\left(a_{\lambda,e,\sigma}\right) \mid \Omega_{\alpha\beta}\left(a_{\bar{\Delta}}\right) \mid \tilde{\varepsilon} \tilde{\delta} \right\rangle \tag{35}$$

For when $\mu = 3, \bar{\omega} = 1$

$$S_{\lambda\gamma}^{\dagger} \overset{n-4}{\underset{\lambda=1}{\otimes}} B_{\lambda\gamma}^{\dagger} A_{\mu\lambda}^{\dagger} \psi = \frac{1}{\eta} \sum_{s=1}^{81} S_{\lambda\gamma}^{\dagger} \overset{n-4}{\underset{\lambda=1}{\otimes}} \overset{4}{\underset{\gamma=1}{\otimes}} \delta^{\dagger} \varepsilon^{\dagger} \left\langle \xi_{\alpha\beta}\left(a_{\lambda,e,\sigma}\right) \mid \Omega_{\alpha\beta}^{\mathrm{T}}\left(a_{\bar{\Delta}}\right) \right\rangle \tilde{\varepsilon} \tilde{\delta}$$

$$S_{\lambda\gamma}^{\dagger} \overset{n-4}{\underset{\lambda=1}{\otimes}} B_{\lambda\gamma}^{\dagger} A_{\mu\lambda}^{\dagger} \psi = \frac{1}{\eta} \sum_{s=1}^{81} S_{\lambda\gamma}^{\dagger} \left\langle \delta^{\dagger} \varepsilon^{\dagger} \mid \xi_{\alpha\beta}\left(a_{\lambda,e,\sigma}\right) \mid \Omega_{\alpha\beta}^{\mathrm{T}}\left(a_{\bar{\Delta}}\right) \mid \tilde{\varepsilon} \tilde{\delta} \right\rangle$$

$$S_{\lambda\gamma}^{\dagger} \overset{n-4}{\underset{\lambda=1}{\otimes}} B_{\lambda\gamma}^{\dagger} A_{\mu\lambda}^{\dagger} \psi = \frac{1}{\eta} \sum_{i=1}^{3} \sum_{j=1}^{3} \sum_{k=1}^{3} \sum_{l=1}^{3} S_{\lambda\gamma i\,jkl}^{\dagger} \left\langle \delta^{\dagger} \varepsilon^{\dagger} \mid \xi_{\alpha\beta}\left(a_{\lambda,e,\sigma}\right) \mid \Omega_{\alpha\beta}^{\mathrm{T}}\left(a_{\bar{\Delta}}\right) \mid \tilde{\varepsilon} \tilde{\delta} \right\rangle \tag{36}$$

For when $\mu = 4, \bar{\omega} = 1$

$$S_{\lambda\gamma}^{\dagger} \overset{n-4}{\underset{\lambda=1}{\otimes}} B_{\lambda\gamma}^{\dagger} A_{\mu\lambda}^{\dagger} \psi = \frac{1}{\eta} \sum_{s=1}^{81} S_{\lambda\gamma}^{\dagger} \overset{n-4}{\underset{\lambda=1}{\otimes}} \overset{4}{\underset{\gamma=1}{\otimes}} \delta^{\dagger} \varepsilon^{\dagger} \left\langle \xi_{\alpha\beta}^{\mathrm{T}} \left(a_{\lambda,e,\sigma} \right) \mid \Omega_{\alpha\beta} \left(a_{\Delta} \right) \right\rangle \tilde{\varepsilon} \tilde{\delta}$$

$$S_{\lambda\gamma}^{\dagger} \overset{n-4}{\underset{\lambda=1}{\otimes}} B_{\lambda\gamma}^{\dagger} A_{\mu\lambda}^{\dagger} \psi = \frac{1}{\eta} \sum_{s=1}^{81} S_{\lambda\gamma}^{\dagger} \left\langle \delta^{\dagger} \varepsilon^{\dagger} \mid \xi_{\alpha\beta}^{\mathrm{T}} \left(a_{\lambda,e,\sigma} \right) \mid \Omega_{\alpha\beta} \left(a_{\Delta} \right) \mid \tilde{\varepsilon} \tilde{\delta} \right\rangle$$

$$S_{\lambda\gamma}^{\dagger} \overset{n-4}{\underset{\lambda=1}{\otimes}} B_{\lambda\gamma}^{\dagger} A_{\mu\lambda}^{\dagger} \psi = \frac{1}{\eta} \sum_{i=1,j=1k=1l=1}^{3} \sum_{}^{3} \sum_{}^{3} \sum_{}^{3} S_{\lambda\gamma ijkl}^{\dagger} \left\langle \delta^{\dagger} \varepsilon^{\dagger} \mid \xi_{\alpha\beta}^{\mathrm{T}} \left(a_{\lambda,e,\sigma} \right) \mid \Omega_{\alpha\beta} \left(a_{\Delta} \right) \mid \tilde{\varepsilon} \tilde{\delta} \right\rangle \tag{37}$$

3. Results

Now, we seek the meaning of $\frac{1}{\eta}$ by first solving a few of the operation as follows:

$$S_{1111}^{\dagger} = \begin{pmatrix} \sigma_x & \sigma_x \\ \sigma_x & \sigma_x \end{pmatrix} = \begin{pmatrix} 0 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 0 \end{pmatrix}$$

$$S_{1112}^{\dagger} = \begin{pmatrix} \sigma_x & \sigma_x \\ \sigma_x & \sigma_y \end{pmatrix} = \begin{pmatrix} 0 & 1 & 1 \\ 1 & 2 & -i \\ 1 & i & 0 \end{pmatrix}$$

$$S_{1113}^{\dagger} = \begin{pmatrix} \sigma_x & \sigma_x \\ \sigma_x & \sigma_z \end{pmatrix} = \begin{pmatrix} 0 & 1 & 1 \\ 1 & 3 & 1 \\ 1 & 1 & -1 \end{pmatrix}$$

We can see that the trace of the above will give 2,

$$S_{1121}^{\dagger} = \begin{pmatrix} \sigma_x & \sigma_x \\ \sigma_y & \sigma_x \end{pmatrix} = \begin{pmatrix} 0 & 1 & 1 \\ 1 & -i+1 & 1 \\ i & 1 & 0 \end{pmatrix}$$

$$S_{1122}^{\dagger} = \begin{pmatrix} \sigma_x & \sigma_x \\ \sigma_y & \sigma_y \end{pmatrix} = \begin{pmatrix} 0 & 1 & 0 \\ 1 & -i+1 & -i \\ i & i & 0 \end{pmatrix}$$

$$S_{1123}^{\dagger} = \begin{pmatrix} \sigma_x & \sigma_x \\ \sigma_y & \sigma_z \end{pmatrix} = \begin{pmatrix} 0 & 1 & 0 \\ 1 & -i+1 & -i \\ i & i & 0 \end{pmatrix}$$

We can see that the trace of the above will give $-i+1$,

$$S^{\dagger}_{1131}=\begin{pmatrix}\sigma_x & \sigma_x\\ \sigma_z & \sigma_x\end{pmatrix}=\begin{pmatrix}0 & 1 & 1\\ 2 & 1 & 1\\ 0 & 0 & 0\end{pmatrix}$$

$$S^{\dagger}_{1132}=\begin{pmatrix}\sigma_x & \sigma_x\\ \sigma_y & \sigma_y\end{pmatrix}=\begin{pmatrix}0 & 1 & 1\\ 2 & 1 & -i\\ 0 & -1+i & 0\end{pmatrix}$$

$$S^{\dagger}_{1133}=\begin{pmatrix}\sigma_x & \sigma_x\\ \sigma_y & \sigma_z\end{pmatrix}=\begin{pmatrix}0 & 1 & 1\\ 2 & 2 & 0\\ 0 & -1 & -1\end{pmatrix}$$

We can see that the trace of the above will give 1,

$$S^{\dagger}_{1211}=\begin{pmatrix}\sigma_x & \sigma_y\\ \sigma_x & \sigma_x\end{pmatrix}=\begin{pmatrix}0 & 1 & -i\\ 1 & 1+i & 1\\ 1 & 1 & 0\end{pmatrix}$$

$$S^{\dagger}_{1212}=\begin{pmatrix}\sigma_x & \sigma_y\\ \sigma_x & \sigma_y\end{pmatrix}=\begin{pmatrix}0 & 1 & -i\\ 1 & 1+i & -i\\ 1 & i & 0\end{pmatrix}$$

$$S^{\dagger}_{1213}=\begin{pmatrix}\sigma_x & \sigma_y\\ \sigma_x & \sigma_z\end{pmatrix}=\begin{pmatrix}0 & 1 & -i\\ 1 & 2+i & 0\\ 1 & 0 & -1\end{pmatrix}$$

We can see that the trace of the above will give $1+i$,

$$S^{\dagger}_{1221}=\begin{pmatrix}\sigma_x & \sigma_y\\ \sigma_y & \sigma_x\end{pmatrix}=\begin{pmatrix}0 & 1 & -i\\ 1 & 0 & 1\\ i & 1 & 0\end{pmatrix}$$

$$S^{\dagger}_{1222}=\begin{pmatrix}\sigma_x & \sigma_y\\ \sigma_y & \sigma_y\end{pmatrix}=\begin{pmatrix}0 & 1 & -i\\ 1 & 0 & -i\\ i & i & 0\end{pmatrix}$$

$$S^{\dagger}_{1223}=\begin{pmatrix}\sigma_x & \sigma_y\\ \sigma_y & \sigma_z\end{pmatrix}=\begin{pmatrix}0 & 1 & -i\\ 1 & 1 & 0\\ i & 0 & -1\end{pmatrix}$$

We can see that the trace of the above will give 0,

After performing the voluminous operations, we find out that there is a cycle in the appearance of the traces of the 81 spin interaction matrices and it is given below in the symmetric matrix:

$$\nu = \begin{pmatrix} 2 & 1-i & 1 \\ 1+i & 0 & i \\ 1 & -i & 0 \end{pmatrix}$$

Symmetricity of ν is conjugal.

We shall label η as η_κ which is the multiplication of the trace of the spin interaction matrix being worked upon and the type of charged interaction involved. We have:

$$\eta_\kappa = \frac{1}{3} e^{\Lambda} tr\left(\sum_{i=1}^{3} \sum_{j=1}^{3} \sum_{k=1}^{3} \sum_{l=1}^{3} S^{\dagger}_{\lambda\gamma ijkl} \bigotimes_{\lambda=1}^{n-4} B^{\dagger}_{\lambda\gamma} A^{\dagger}_{\mu\lambda} \psi \right) \tag{38}$$

Where the $\frac{1}{3}$ is because of the three cycles of similar traces. There are 27 in each cycle.

We shall now find the determinants of each of these spin interaction matrices. These results will be added to the subsequent atoms in the values of μ and ω. We have:

$$D_{\mu\lambda\gamma} = \left| S^{\dagger}_{\lambda\gamma} \bigotimes_{\lambda=1}^{n-4} B^{\dagger}_{\lambda\gamma} A^{\dagger}_{\mu\lambda} \psi \right|_{\Delta} \tag{39}$$

Where the subscript Δ is to emphasize that the actual value needed is the coefficient of D.

In order to determine the next atom to be selected so as to add D to, we have:

$$g^{\dagger} \tilde{A}^{\dagger}_{\mu\lambda} \psi = \frac{\chi a \chi^{\mathrm{T}}}{\chi \chi^{\mathrm{T}}} \tag{40}$$

Where $\chi = \frac{1}{3} tr\left[\tilde{A}^{\dagger}_{\mu\lambda} \psi \tilde{\varepsilon} \right]$

We shall now, implement the importance of the dopant atom into the system. The dopant atom is of different properties such as the atomic mass and number and density and so on. Therefore, we shall find the fraction of its density to that of the rest of the lattice, m_{pure}. The rest of the lattice refers to the most populated group of atoms in the lattice. So we have:

$$M_{\mu\lambda\gamma} = \frac{m_{dopant}}{m_{pure}} \tag{41}$$

Eventually, the energy drifting to the center at any instance of time will be given as:

$$H_{\bar{g}} = \bigotimes_{\tilde{\omega}=1}^{N} \bigotimes_{\mu=1}^{n} \left\{ D_{\mu\lambda\gamma} + M_{\mu\lambda\gamma} + g^{\dagger} \tilde{A}^{\dagger}_{\mu\lambda} \tilde{\varepsilon} \right\} \psi \tag{42}$$

4. Conclusions

We have shown how the gravitation affects the doping effect. The a-core types are typical of almost all known molecules as there is almost all probability that there will be an atom at the center of a molecule. However, a possible example of the a-core-less type should be a collapsed neutron star or black hole. This is because of its seemingly limitless tendency to keep attracting particles including light.

We, therefore, propose that the development of gravitation in matter like our planet earth, is based on (1) the type of core: a-core or a-core-less and (2) what atom (or groups of atoms are or) is at the center of the core. For instance, we make bold to say that, the most likely reason for the abundance of carbon and silicates on the outer-most parts of our planet earth may be because the core of the earth is much higher in concentration of much relatively heavier atoms such as iron and nickel. Therefore, it is likely true that if the abundance of a type of atom is located on the surface of a planet, then the core of such planet may be made up of much heavier atoms. The presence of iron and nickel at the core of the earth makes rare earth minerals very rare on our planet earth. These results and many more

that could be derived from the formulae above are, basically, as a result of the idea that there is a form of gravitation only induced during doping processes. The form of gravitation tends to remain at rest, not active, until the dynamic nature of our universe activates it by doping a material with another.

References

WideGap 2001 Conference. (2001). *Compound Semiconductor*. Conference Procedings, Journal of Physics: Condensed Matter, CSJunWideGap (pp. 55-57).

Bryan, J. D., & Gamelin, D. R. (2005). Doped semiconductor nanocrystals: synthesis, characterization, physical properties, and applications. *Prog. Inorg. Chem, 54*, 47-126. http://dx.doi.org/10.1002/0471725560.ch2

Walsh, A., Buckeridge, J., Catlow, C. R. A., Jackson, A. J., Keal, T. W., Miskufova, M., ... & Sokol, A. A. (2013). Limits to Doping of Wide Band Gap Semiconductors. *Chemistry of Materials, 25*(15), 2924-2926. http://dx.doi.org/10.1021/cm402237s

Halliday, D., Resnick, R., & Walker, J. (2001). *Fundamentals of physics*. John Wiley & Sons.

Neukirch, S., & Giacomini, H. (2000). Shape of attractors for three-dimensional dissipative dynamical systems. *Physical Review E, 61*(5), 5098.. C.N.R.S Laboratoire de Mathematiques et de Physique Theorique. France. http://dx.doi.org/10.1103/PhysRevE.61.5098.

Kolomietz, V. M. (2011). *Non-Markovian nuclear dynamics*.

Coleman, P. (2011). *Introduction to Many-Body Physics*.

Riley, K. F., Hobson, M. P., & Bence, S. J. (2002). *Mathematical Methods for Physics and Engineering*. Cambridge University Press.

Landau, R. H., Páez, M. J., & Bordeianu, C. C. (2007). Computational physics. *Computer Languages, 7*, 2-3.

Mandl, F. (1992). *Quantum Mechanics*. John Wiley & Sons.

Copyrights