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Atomic Structure and Binding of Carbon Atoms

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Abstract – Many studies deal synthesis of carbon because of its versatility but lack the arresting of understanding at convincing and compelling levels. A binding energy shape-like parabola is linked to state of handing over electron to state of taking over at each opposite-side of the atom maintaining the equilibrium of resulting new state of the carbon atom. Through this mechanism of transferring electrons for the gas state carbon atom, it converts into graphitic state, nanotube state, fullerene state, diamond state, lonsdaleite state and graphene state carbon atom. Exerting forces to relevant poles of transferring electrons work neutral to attain specific state of their carbon atom. Structure evolutions in graphitic, nanotube and fullerene state carbon atoms are remained one-dimensional, two-dimensional and four-dimensional, respectively, where energy shape-like parabola is involved along the relevant quadrant for transferring electron(s) where neutral behavior of exerting forces is engaged. A graphite structure when develops under attained dynamics of atoms and their binding is under a bit difference of involved opposite pole forces, it develops in two-dimensional also. Evolution of structure in diamond, lonsdaleite and graphene state carbon atoms is under the involvement of potential energy of electrons as per their undertaking the infinitesimal displacements, thus, engaging their relevant poles exerting forces in the orientationally-controlled manner. Growth of diamond is south to ground, but binding of atoms is ground to south, so, it is a tetra-electrons ground to south topological structure. Lonsdaleite is a bi-electrons ground to just-south topological structure. Growth of graphene is just-north to ground but binding of atoms is ground to just-north, so, it is a tetra-electrons ground to just-north topological structure. Glassy carbon is related to a layered-topological structure where successive tri-layers of gas, graphitic and lonsdaleite state atoms bind in the repetitive manner. In glassy carbon, pair of orientated electrons of gas and lonsdaleite state carbon atoms undertake another clamping of pair of unfilled energy knots by entering from the rear-side and front-side, respectively, to bind to

intermediate layers of graphitic state atoms. Different carbon atoms develop amorphous structures when they bind under frustrating amalgamation. Hardness of carbon-based materials is also sketched in the light of different force-energy behaviors of different state carbon atoms. Here, structure evolution in each carbon state atom explores its own science.

Keywords: Carbon; Atomic structure; Force-energy; Atomic binding; Structure

1.0 Introduction

Developing selective size and shape materials and investigating their characteristics at the outlets of forefronts of applications solicit new sort of approaches and observations. Wherever, exerting forces at electron levels involve the process of evolving structure while engaging the energies or wherever, energies (or potential energies) involve the process of evolving structure while engaging the exerting neutral forces (or orientationally-controlled exerting forces) at electron levels, the execution of their dynamics as per built-in gauge of the atom (belonging to suitable element) should be considered. The force and energy of the atoms are to be considered in conservative mode in the first case and in the non-conservative mode in the latter case. Engaging (or involving) energy to involve (or engage) force of different format is to be considered as per built-in gauge of electron-dynamics in atoms of evolving different class of structures. When carbon atoms of gas state are converted into certain state of their established physical behavior, they are to be anticipated for evolving structure under attained dynamics and electron-dynamics under the chain of command of energy first instead of force as first. However, when conservative forces exerted for neutral state silicon atom, an uninterrupted execution of electron-dynamics results into transform heat energy having a wave like energy [1]. This indicates that built-in gauge of electron-dynamics in the case of carbon atom is different as compared to silicon atom despite of the fact that the same number of filled states and unfilled states are available in their outer ring. But the distance of each electron of outer ring from the center of its atom is different in the case of carbon and silicon elements [2]. Such naturally originated approaches based on the multidisciplinary point of view may result into originate understandings to understand a different atomic nature and its behavior, which can be very different to the existing ones. Owing to availability of atoms at different levels where they involve the

conservative forces, they evolve their structures in different dimension and format [3]. It is also essential to know that, prior to study atomic structure of carbon and binding of the different state carbon atoms, atom belonging to none of the elements is ionized [4]. Understanding the mechanism of evolving structure based on the different state carbon atoms relying on the same chemistry at input end is essential. In different spectroscopic analyses, peaks at different wave number and different energy of tiny grains comprising different state carbon atoms are resulted [5]. Additionally, depending on the process conditions and employed technique, source of gas carbon atoms work for the evolution of different morphology and structure of tiny grains, grains and crystallites where that would switch into different morphology and structure because of minor fluctuation of the parameters [6]. Again, different morphology of grains and crystallites was observed at different chamber pressure identifying role of arresting typical energies near to/at substrate with different rate for each resident chamber pressure [7]. Moreover, it has been discussed that deposition of graphite and diamond, in distinctive manner, at single substrate is under the differently set inter-wire distance of dissociating gases [8].

Atoms of carbon having different states are known in the allotropic forms but, they have a different history of referring, more possibly, starting from the gas state carbon atom, graphitic state carbon atom, then, diamond and lonsdaleite state carbon atoms, fullerene state carbon atom following by nanotube state carbon atom and glass carbon, and recently, the graphene state carbon atom. Several studies on carbon-based materials are available in the literature explaining the conditions of deposition and their resulted effects in the form of morphology, growth rate, quality and application, etc.

It is necessary to understand dynamics of development of tiny-sized particles prior to go for assembling into large-sized particles [9]. Agglomerations of colloidal matter envisage atoms and molecules to deal them as materials for tomorrow [10]. Developing of different features tiny-sized particles has been discussed elsewhere [11]. The developing mechanism of tiny-shaped particles under certain concentration of gold precursor was discussed [12]. Under identical process parameters, the nature of precursor directs tiny-shaped particles following by the development of their large-shaped particles where role of the required atomic nature was also in focus [13]. Different tiny-shaped particles following by large-sized particles were

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developed under the application of nanoshape energy while varying the bipolar pulse and pulse polarity [14]. Developing large-sized particles shows very high development rate [15]. Developing monolayer tiny-shaped particle under the application of nanoshape energy was discussed where atoms of one-dimensional arrays converted into structures of smooth elements [16]. Certain nature atoms of tiny-sized particles undertake different behaviors resulting into work as either effective or defective nanomedicine [17]. Gold particles of unprecedented shapes have been developed under tailored conditions of processing solution [18]. Hard coating of certain gas and solid atoms developed because of their established transitional force-energy behaviors [19].

Atoms of different elements are to be recognized on their physical attributes and their structures are also considered to be based on the physical behavior. Carbon atoms undertake several physical behaviors even though it is known to be of unique chemical nature. Carbon materials comprised identical state atoms which indicate a very different behavior with respect to each other which is categorized at clear grounds [5-8]. This indicates that transition of electrons within designated states or transfer of certain electron to nearby unfilled state (within the same ring) change the nature of atom resulting into introduce a new phenomenon. In gas and solid atoms belonging to suitable elements, electrons of transition do not cross the north-pole or south-pole of their atom, but they do cross their own projected north-south poles to undertake liquid transition state [2]. It is also observed that force behavior along entering the ground surface (north-pole) and leaving the ground surface (south-pole) is different as compared to force behavior at/near ground surface (east-west poles) [20]. Thus, the available option for transferring electron of filled state to unfilled state in all suitable atoms is to be left at left-side or right-side of their atoms. So, the available option for transition of electrons in gas atoms or solid atoms (belonging to the suitable elements) is only within the clamped energy knots where they undertake established transition states namely, recovery, neutral, re-crystallization and liquid states depending on the rate of their infinitesimal displacements. The center of each atom is related to null exerting forces of different poles as it is declared as the common point of inter-crossed overt photons having no mass of the electrons [2]. When the ground point of an atom is at above ground surface, it is recognized in the gas state where dominating force is to be considered because of the space format.

When the ground point of an atom is at below ground surface, it is recognized in the solid state where dominating force is to be considered because of grounded format. When the ground point of an atom is at average-leveled ground surface, it is being recognized in the partially solid behavior where dominating force is to be considered because of surface format. Evolution of different dimension structures in atoms of nearly (semi) solid behavior, solid behavior and highly solid behavior at just above ground surface, at ground surface and at below ground surface, respectively, envisage different format of exerting forces at electron levels [3].

Atomic binding in different state carbon atoms is remained challenging since the birth of carbon element and only partial information on evolution of graphite structure is available. Then, atom to atom binding when carbon is in diamond state is remained challenging where at one side, a large crystallite is growing and on the other side, a single atom of diamond state deposited on it to grow further. Then, origin of structure evolution in other carbon states atoms is also remained challenging. Evolution of structure comprised layers of certain state carbon atoms in a repeated order, also. In the present work, atomic structure of different state carbon atoms is pinpointed along with structure evolution of all possible states of carbon atoms. This study describes the science of originating different states of carbon atoms and their structure evolution.

2.0 Results and discussion

The lattice of a carbon atom is shown in Figure 1 (a) where four unfilled states (energy knots) at the center are related to zeroth ring, whereas, eight unfilled states (energy knots) around the zeroth ring are related to outer ring (first ring). Each energy knot is formed by the precise inter-crossing of the overt photons having certain equal length where the trough of one is in-front of the crest of other resulting into arrest the element of their force. Two pairs of overt photons having wavelength of current when inter-crossed by keeping their common center (comprising each pair of four troughs and four crests), states of eight electrons formed by the resulted eight hollow regions where the element of their force remains intact along with the shielded energy. When two pairs of photons having characteristic of current inter-crossed at the same center along north-south axes, they result into compress two states of each pair forming at opposite sides because of already inter-crossed

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double pair along east-west poles. This results into form the hollow regions for only four states of electrons as shown in Figure 1 (a). Pairs of certain length overt photons inter-crossed to form the states of clamping energy knots of twelve electrons under the maintenance of their common center. Among twelve states of electrons, central four are related to zeroth ring and outer ring of eight sites form the first ring where four remained filled and four remained unfilled, thus, providing the option to originate six different state behaviors of a carbon atom in addition to the gas state. In Figure 1 (b), a gas state carbon atom is shown and remaining different states of a carbon atom are shown in Figure 1 (c-h) where the positions of electrons belonging to the outer ring are changed accordingly; in (c) graphitic state, (d) nanotube state, (e) fullerene state, (f) diamond state, (g) lonsdaleite state and (h) graphene state carbon atoms are shown. For each different state carbon atom, the central four electrons form the zeroth ring, which is termed as nucleus and is a helium atom as well [2].

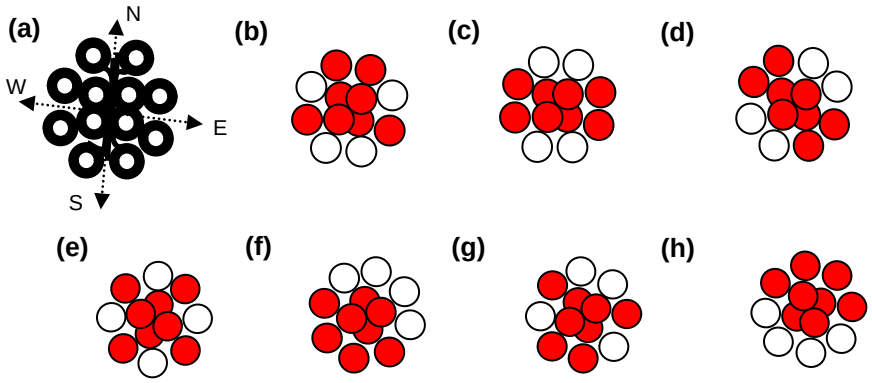

Figure 1: (a) lattice of a carbon atom, atomic structure of carbon atom when in (b) gas state, (c) graphitic state, (d) nanotube state, (e) fullerene state, (f) diamond state, (g) lonsdaleite state and (h) graphene state; filled red colored circles indicate filled states, filled white colored circles indicate unfilled states and black colored rings indicates clamping energy knots to states; drawn in estimation

A gas state carbon atom, when it is in the process to transfer two electrons of filled state to nearby unfilled state, one from the right-side and one from the left-side for one state migration, it is by the involved energy shape-like built-in gauge of the electron-dynamics where engaged exerting forces of relevant poles to those electrons remain neutral. Thus, a transferring electron exactly obeys the trajectory of bound energy to energy knots of filled and unfilled states. Each binding energy shape-like parabola for each transferring of the electron, one from the east-side and one from the west-side of the atom, enable conversion of gas state carbon atom into

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graphitic state carbon atom. In transferring all four electrons of outer ring to unfilled states available below to east-west poles (central line) in gas state carbon atom, three pairs of energy shape-like parabola involved, which results into convert it into a diamond state carbon atom. The exerting forces of relevant poles at instant of transferring electrons for each dedicated state of their atom are remained neutral.

When gas state carbon atom converts into graphitic state carbon atom, it is under the availability of energy shape-like parabola where certain electron of left-side and certain electron of right-side are transferred by engaging the neutral behaviors of exerting forces for them. The exerted forces are related to space format and surface format, which are being kept neutral at the instant of transferring electrons because of the blockage of electrons belonging to zeroth ring of that carbon atom. However, transferring required electrons of graphitic state carbon atom for lonsdaleite state carbon atom, an energy shape-like parabola along west to south and an energy shape-like parabola along east to south are involved where the neutral behaviors of exerting forces for them are engaged also. But, exerted forces for transferring electrons are related to surface format and grounded format. In conversion of lonsdaleite state carbon atom from graphitic state carbon atom, only two electrons transferred to dedicated states under involved typical energies. But, on conversion of diamond state atom from lonsdaleite state atom, two electrons further transferred to dedicated states under the involved typical energies. At that instant, ground point of the diamond state carbon atom became further below to ground surface as compared to lonsdaleite state carbon atom as it possesses ground point at just below the ground surface. Transferring of all four electrons of outer ring toward south-pole in a carbon atom, two from the left-side of south-pole and two from the right-side of the south-pole, results into ground point of the carbon atom to become fully grounded, which is related to diamond state carbon atom. Thus, transferred electrons undertake the maximum potential energy, which is being maintained under the exertion of orientating gravitational force to the maximum extent where clamped energy knots to electrons possess the maximum expansion also.

Due to the very small distance of outer ring from the center of carbon atom, exerting forces of east and south poles, east and north poles, west and south poles and west and north poles for transferring a filled state electron to nearby unfilled state, in each case, become almost equal. Thus, energy shape-like parabola

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regulates it for the entire trajectory forming between filled to nearby unfilled state. So, the relevant forces exert neutral while transferring electrons of opposite sides in carbon atom and under the involved set of typical energies. Therefore, that carbon atom originates a new state behavior under the maintenance of equilibrium. Under the maintenance of equilibrium, transferring electrons of outer ring in graphitic state carbon atom converted it into fullerene state carbon atom. A gas state carbon atom converted into nanotube state carbon atom. But, a fullerene state carbon atom can be converted directly into nanotube state under the supply of two unit-energy shape-like parabola. A graphitic state carbon atom is converted into diamond state, lonsdaleite state and graphene state carbon atom, one by one, under the supply of different number unit-energy shape-like parabola where the exerting forces to electrons do not disturb them to follow the trajectory as they remain neutral for all poles of an electron. Energy knots forming the unfilled and filled states of the lattice of carbon atom expand or contract to different extent depending on the position of electrons belonging to outer ring, which can be shown precisely under the application of animated software.

An occupied state of the electron or unoccupied state (position) in the atom is termed as ‘state’, whereas, based on newly occupied state of the electron in atom, it is also termed as ‘state’ but here the atomic state, instead of electron state, originates a new physical behavior of that atom belonging to same carbon element. Depending on the attained position of electrons in their atom, the contraction and expansion of clamped energy knots are to be adjusted accordingly and, then, relatively to the companion ones, also.

In Figure 2 (a), binding of graphitic state carbon atoms is shown; when one amalgamated atom is already in the graphitic state (atom A) and another atom (atom B) is in the transition state to attain the graphitic state. At that instant, their involved energies for transferring the electrons of filled states to dedicated ones for attaining graphitic state of that carbon atom is also being utilized to bind. So, graphitic state carbon atoms bound adjacently along the same axis. However, that energy was absorbed prior to transfer an electron where it follows its trajectory shape-like parabola to attain the graphitic state of atom where role of the engaged forces (in both space format and surface format) is remained impartial (unbiased/neutral). Thus, that atom (atom B) bound (to atom A) at instant of just converting into graphitic

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state. On binding of atom B to atom A under involved typical energies shape-like parabola, they evolve the graphite structure under the repetition of the same scheme. Under the same scheme through which atom A bound to atom B, atom B bound to atom C as shown in Figure 2 (a). In the binding of graphitic state carbon atoms, the involved energy is also being protected by the neutral behavior of exerting forces as the shape of typical energy and its connections between nearby relevant energy knots do not affect. The exerting neutral behavior forces in binding graphitic state carbon atoms are remained along the same axis as shown in Figure 2 (a), so, developing graphite structure is one-dimensional. In developing graphite structure under the execution of electron-dynamics of atoms, their binding is remained adjacent along the single direction of X-axis. Under the execution of electron-dynamics, this one-dimensional structure evolution in graphitic state carbon atoms can be in the single direction of opposite-side of X-axis. Atoms of such one-dimensional arrays while evolving their tiny grains elongated under the exertion of surface format forces to convert them into structures of smooth elements [5].

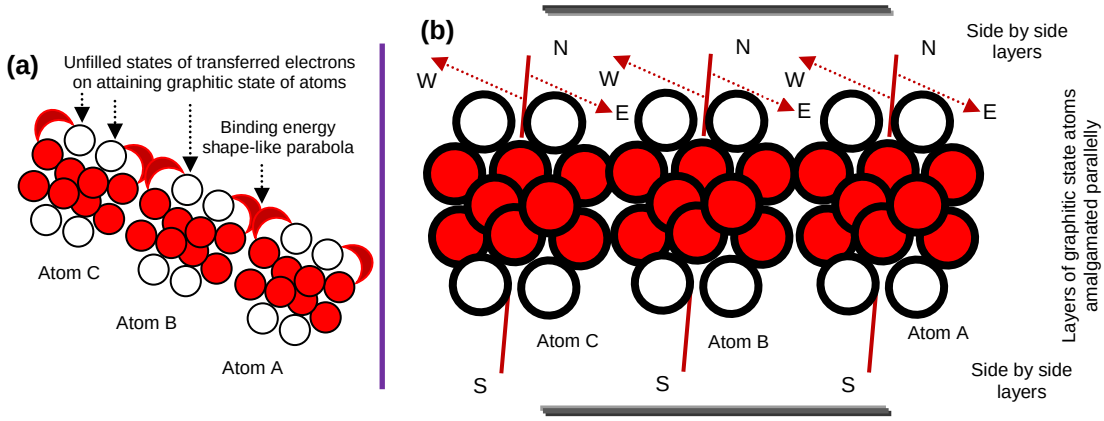

Figure 2: Structure evolution in graphitic state carbon atoms (a) when executing electron-dynamics under suitable amalgamation, they evolve a one-dimensional structure and where (b) amalgamated atoms engaged forces only under the attained dynamics, they evolve a two-dimensional structure

When atoms amalgamated under preserving their graphitic state, they only bound under the attained dynamics, thus, evolved structure without the execution of electron-dynamics. At this instant, the developing graphite structure becomes two-dimensional. The typical energies shape-like parabola no more involved to bind graphitic state carbon atoms. Because of the slight difference of exerting east-west forces at point of amalgamated two graphitic state atoms to central one, they remain bound only under attained dynamics as shown in Figure 2 (b). When identical layers of graphitic state atoms are developed side by side (parallelly) to that layer, upward-

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side and downward-side (or only for one side), that graphite structure undertakes two-dimension as the force difference along other poles also contributes. Even though existing forces of opposite poles don't work for an appreciable difference to allow binding of graphitic state carbon atoms, but, they, at least, also don't allow atoms to go away from each other. Under the opposite poles forces of east-west, graphitic state carbon atoms adjust along the both directions of X-axis where they amalgamate adjacently.

When the surface of evolving graphite structure is not flat at electron level, the influences of exerting north-south forces are also included resulting into transform developing structure of graphitic state carbon atoms into amorphous state graphite structure. The evolution of amorphous structures may be considered in the case of other states of carbon atoms where frustrated attained dynamics of atoms can distort evolving structure of a certain state carbon atoms. Uneven surfaces for developing only the first layer further engage the forces of north-south poles under non-uniform distribution resulting into further maintain the developing amorphous state graphite structure.

A nanotube state carbon atom converts from the fullerene state carbon atom prior to go for assembling where forces of relevant poles of transferring electrons remain neutral and only the involved energy transferred them to their dedicated unfilled states. A carbon atom of nanotube state evolves structure under the involvement of binding energy for atoms attaining the identical state at instant of amalgamating as shown in Figure 3 (a). Here, a fullerene state carbon atom converts into a nanotube state carbon atom on transferring electron to nearby unfilled state for each opposite quadrant. Atoms of such carbon state bind under the neutral behavior of exerting forces to electron in surface format and space format for one quadrant and exerting forces to electron in surface format and grounded format for the opposite quadrant. In the case of evolving structure of nanotube state carbon atoms by executing their electron-dynamics in two opposite quadrants, the neutral behavior of exerting forces while transferring electron to dedicated state for each quadrant also falls in the opposite formats. The energy shape-like parabola is involved to transfer electron of a dedicated state, one from south-side and one from north-side, but in the opposite quadrants of atom resulting into bind amalgamating atoms at both sides as shown in Figure 3 (a). As the binding of atoms in nanotube structure have two opposite

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quadrants, in either way, the evolution of structure is related to two-dimensional, but the overall shape of nanotube appears in one-dimensional shape as shown by the two options in Figure 3 (a).

A carbon atom attains fullerene state under the transfer of electron at each dedicated state of pole while engaging the energy shape-like parabola for all four quadrants where transferring electron of each quadrant engages neutral behavior of exerting forces of relevant poles. Here, a contribution of exerting neutral force of space format for two quadrants along with surface format and a contribution of exerting neutral force of grounded format for two quadrants along with surface format is to be considered. A characteristic energy shape-like parabola while binding of identical state atoms at point of executing electron-dynamics is shown in Figure 3 (b); evolution of fullerene structure in two different ways is shown. This indicates that structural evolution in fullerene state carbon atoms is four-dimensional. Binding of fullerene state carbon atoms to evolve fullerene structure is for all four quadrants of nearly plane surface forming angle either at nearly mid of each quadrant or at nearly along north-south poles and east-west poles. A fullerene state carbon atom converts from the nanotube state carbon atom prior to go for assembling where exerting forces of relevant poles at the instant of transferring electrons remain neutral and only the involved energy transferred them to dedicated states. In the fullerene state carbon atom, upper-sided transferred electrons engaged the neutral exertion of forces in space format and surface format while lower-sided transferred electrons engaged the neutral exertion of forces in grounded format and surface format.

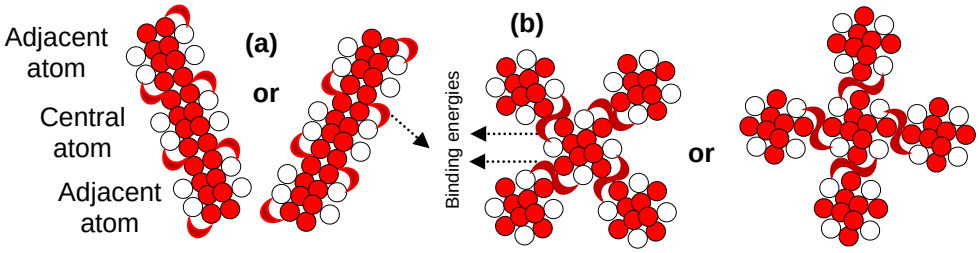

Figure 3: (a) nanotube structure– a two-dimensional structure where the involved energy shape-like parabola in opposite quadrants of targeted atom binds amalgamated atoms at left-side and right-side and (b) fullerene (buckyballs) –a four-dimensional structure where the energy shape-like parabola involved in each quadrant of targeted atom binds four amalgamated atoms

A lonsdaleite state carbon atom having ground point just at below ground surface is shown in Figure 4 (a), which is approaching to deposit (bind) to diamond state carbon atom once it is converted into a diamond state carbon atom also. A diamond

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state carbon atom, which has already attained ground point at sufficiently below to the ground surface, is also shown in Figure 4 (a). The expected binding point of atoms when both are binding in diamond state is also labelled. In the nucleation of synthetic diamond, a deposited atom is at highly heated scratched seeded surface of solid which doesn't allow it further to attempt gravitation behavior of electrons because of having the maximum potential energy under orientationally-controlled exerting forces of fixed poles, therefore, no more expansion of clamped energy knots takes place. So, those electrons don't further encroach their resting surface even to the extent of size (mass) of an electron resulting into maintain the diamond state of their atom. Thus, that diamond state carbon atom is in full limit of solid behavior. Therefore, the ground point of diamond state carbon atom is at sufficiently below to ground point of lonsdaleite state carbon atom which is a bit below to ground surface. In this context, lonsdaleite state carbon atom is in less expansion of clamped energy knots to filled and unfilled states forming its lattice as compared to ones in diamond state carbon atom. In Figure 4, sketches of different entities are drawn in estimation where less and more expansion of clamped energy knots to filled and unfilled states of carbon state atoms can be drawn under the application of dedicated software.

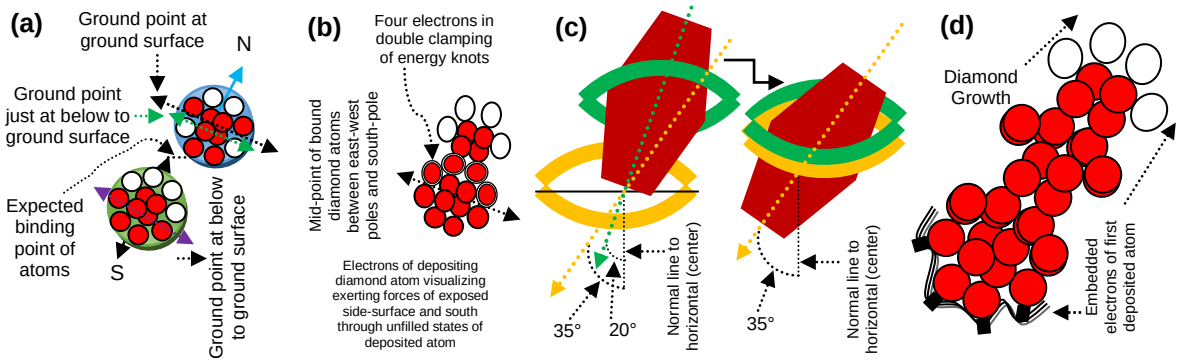

Figure 4: (a) ground points of lonsdaleite and diamond state carbon atoms along with the expected binding point of two diamond state carbon atoms, (b) depositing diamond state carbon atom when four electrons of outer ring undertake double clamping of energy knots under visualizing the forces of side-surface and south poles where they rightly located above the four unfilled states of deposited diamond state carbon atom, (c) orientation of certain electron of lonsdaleite state carbon atom, prior to conversion and orientation, when it undertakes conversion into diamond state carbon atom where clamping another energy knot belonging to certain unfilled state of deposited diamond state carbon atom and (d) growth of diamond is south to ground; red colored circles indicate filled states, white colored circles indicate unfilled states and red colored double-circles indicate electrons of double clamping of energy knots.

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The ground point of lonsdaleite state carbon atom is just at below ground surface because, it should be underneath to ground point of graphitic state carbon atom. In diamond state carbon atom, electrons are in their maximum gravitation behavior where expansion of clamped energy knots has also come to the maximum extent. The resulted energy against the work done of electrons in diamond state carbon atom dissipated enabling expansion of clamped energy knots to the maximum extent. Electrons of lonsdaleite state carbon atom exert orientational force at lower degree angle from the normal line of their center resulting into possess lower amount of potential energy, hence, their clamping energy knots are in lesser expansion.

On the transfer of left two electrons to downward-side unfilled states, lonsdaleite state carbon atom is converted into diamond state carbon atom also. Now, electrons of that converted diamond state carbon atom also undertake the same level of expansion in terms of clamped energy knots as in the case of targeted (deposited) diamond state carbon atom. But, on just grounding diamond atom on deposited diamond atom, a controlled expansion of clamped energy knots in both diamond state atoms are being monitored under the application of orientationally-controlled exerting forces of relevant poles of electrons (in surface format and grounded format). This results into undertake targeted electrons for another clamping of energy knot, in each case, through targeted unfilled states of already deposited diamond state carbon atom where they visualized the exerting force of relevant poles while arriving rightly over them (targeted unfilled states). Each electron of filled states belonging to outer ring of depositing diamond state carbon atom undertakes another clamp of energy knot of unfilled states belonging to outer ring of deposited diamond state carbon atom resulting into their binding as shown in Figure 4 (b). On binding diamond state atoms, their combined filled and unfilled states along with zeroth rings adjust and compensate both expansion and contraction behaviors by constructing new binding point for the following depositing diamond state carbon atom.

Lonsdaleite state carbon atom undertakes less expansion of energy knots clamping electrons and vacant sites as compared to the diamond state carbon atom. Therefore, a lonsdaleite state carbon atom is more related to the recovery state of an atom where orientation of exerting force to each electron clamped by energy knot becomes ~20° angle from the normal line drawn from its center (270°+20°=290°). Hence, in diamond state carbon atom, expansion of clamped energy knot to electron

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is taken place under the exertion of relevant poles forces ~35° angle from the normal line drawn from its center (270°+35°=305°). The angles of exerting forces of relevant poles of electrons of lonsdaleite state carbon atom and diamond state carbon atom from their normal line drawn at the center are shown in Figure 4 (c); electron of diamond state when undertook double clamping of energy knot to bind another diamond state carbon atom is also shown, separately at right-side.

Overall growth behavior of diamond state carbon atoms is shown in Figure 4 (d); binding of diamond state carbon atoms remained in-progress under the same mechanism of converting gas state carbon atoms where diamond state carbon atoms adjust and compensate contraction and expansion of clamping energy knots to their electrons each time for binding to new diamond state carbon atom. Therefore, in diamond binding, growth behavior is from south to ground where binding point of the atoms remains between surface format and grounded format. Embedded electrons under suitable mechanism of the first deposited (arrested) diamond state carbon atom is also shown in Figure 4 (d) where they directed themselves ground to south under the maximum expansion of clamped energy knots. At that instant, electrons of depositing diamond atom remain detained in their clamped energy knots. So, when the binding of third diamond state carbon atom is in process, those electrons of second deposited atom are being detained by the unfilled states of first deposited atom to undertake the already clamped energy knot to each of them firmly and precisely. A double clamping to electrons becomes apprehend on adjusting the expansion-contraction of the lattice by those two atoms, which came into force just reaching third diamond state carbon atom on their surface as it locates a new point of binding with respect to already bound two deposited diamond carbon atoms. This will lead the growth process of diamond as shown in Figure 4 (d).

When the depositing diamond state carbon atom reaches precisely over the deposited diamond state carbon atom, two inside electrons of outer ring undertake exertion of force of the pole of outer-side (left-side electron west-pole and right-side electron east-pole) equal to the exertion of force of the south-pole where exertion of the force along the north-pole becomes negligible. On undertaking another clamp of energy knot (belonging to upward-side of deposited atom) by those two electrons (belonging to downward-side of depositing atom), their outer-sides left two electrons also come into the precision to undertake another clamp of left two energy knots of

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outer-sides as shown in Figure 5. So, the mechanism of undertaking double clamp of energy knot by each electron is first by the inner two electrons following by the left two electrons for both quadrants of the south-pole of binding diamond state carbon atom. Therefore, exertion of one-pole force to outer-side of the electron and one-pole force to tip-side of that electron remains diligent in controlling its position at instant of clamping another energy knot till grounding under the mid half-length to the downward side where only the one-pole force of surface format (exposed side-surface) and south-pole force of grounded format remained operational to undertake double clamping of energy knot. Both energy knots clamped by each electron expanded under disappeared exertion of one-pole force of surface format and north-pole force of space format are shown in Figure 5. In depositing diamond state carbon atom, inner two electrons touch to in-front electrons of zeroth ring, thus, further increasing their potential energy through infinitesimal displacement where orientationally-controlled exerting forces (left-side electron along west- and south-poles and right-side electron along east- and south-poles) result into another clamp of energy knot and, so, for the remaining two electrons as shown in Figure 5.

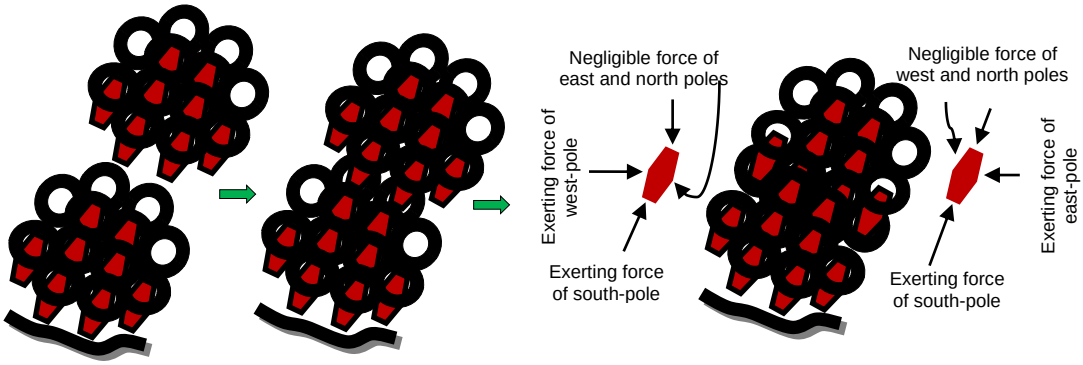

Figure 5: Binding of depositing diamond state carbon atom to the rooted diamond state carbon atom along with exertion of forces to the exposed sides of left-side electron and right-side electron

The mechanism of binding lonsdaleite state atoms obeys the identical process as for the case of binding of diamond state carbon atoms. However, only two orientated (~290°) electrons of lonsdaleite state atom clamp another clamping of energy knot belonging to deposited lonsdaleite state carbon atom. In this manner, one atom dealt the force of just grounded format while the other atom undertook the force of surface format locating a new joint ground point approaching just in the grounded format. Therefore, binding in lonsdaleite state carbon atoms is ground to just-south but growth behavior is just-south to ground. The involved characteristic energy to convert gas state carbon atom into lonsdaleite state carbon atom is in the

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same shape as for the diamond state carbon atom but in fewer amounts because of transferring of only two electrons along south-pole, at each left-side and right-side.

The ground point of graphene state atom doesn't lie at ground surface, but it lies just at above ground surface. Therefore, graphene state carbon atoms undertake contraction of clamping energy knots under exertion of force of electrons where their levitation behavior is at pronounced level. Binding of graphene state carbon atoms includes exerting forces in surface and space formats where binding of atoms is ground to just-north. But, the growth of graphene is just-north to ground. This is the reason why graphene structure is based to only few layers as it is challenging to maintain exerting forces for further elevation. Therefore, in evolution of graphene structure, the binding mechanism of atoms is opposite to the one as for diamond.

One more physical behavior of carbon atoms is resulted when layers of three different states carbon atoms bind in repetitive manner; first layer of gas, second layer of graphitic and third layer of lonsdaleite state carbon atoms bind in successive manner. Exerting forces of relevant poles of electrons (belonging to different state carbon atoms ordered in three consecutive layers in repetitive manner) are being kept engaged by their involved (gained) potential energies resulting into the binding of atoms of layers to evolve structure of glassy carbon. Atoms of central layer are belonging to graphitic state carbon atoms. Layers of gas and graphitic state atoms bind under the joint application of exerting grounded and surface format forces where involved orientationally-controlled potential energies of paired-electrons (of gas state carbon atoms) undertake double clamping of energy knots of paired unfilled states (of graphitic state carbon atoms) by directing from their rear-side. Gas state carbon atoms attempted forcefully the gravitation behavior under increased potential energy of their electrons. Layers of lonsdaleite state carbon atoms and graphitic state carbon atoms bind under the joint application of exerting space format and surface format forces where involved orientationally-controlled potential energies of paired-electrons (of lonsdaleite state carbon atoms) undertake double clamping of energy knots of paired unfilled states (of graphitic state carbon atoms) by directing from their front-side. Lonsdaleite state carbon atoms attempted forcefully levitation behavior under decreased potential energy of their electrons. Layers of lonsdaleite state carbon atoms and gas state carbon atoms provide compensation in terms of expansion-contraction of bound layers of atoms as shown in Figure 6.

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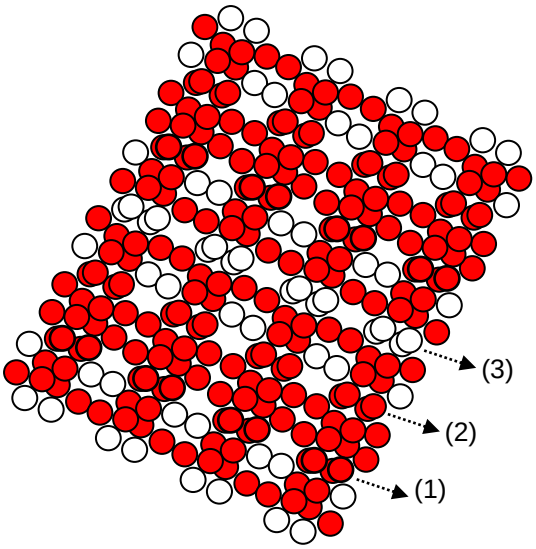

Figure 6: Structure evolution of glassy carbon where tri-layers of gas, graphitic and lonsdaleite state carbon atoms respectively bind in the successive manner; (1) paired electrons of each atom (belonging to gas state carbon atoms layer) undertake double clamping of paired energy knots of each atom (belonging to graphitic state carbon atoms layer) by entering from the rear-sides, (2) paired electrons of each atom (belonging to lonsdaleite state carbon atoms layer) undertake double clamping of paired energy knots (belonging to graphitic state carbon atoms layer) by entering from the front-sides and (3) layers of gas and lonsdaleite state carbon atoms provide compensation in binding their layers to the layer of graphitic state carbon atoms

In carbon, electrons of outer ring transfer to nearby unfilled states to originate different state behaviors of their atom. Transferring electrons of filled states to unfilled in the carbon atom involved the non-conserved energy through which non-conservative forces engaged. However, wherever, the conservative forces involved addressing the dynamics of electrons of certain natured atoms, they engaged the conserved energy as well. As in the case of neutral state silicon atom where a filled state electron is transferred to nearby unfilled state on exerting the conservative forces along relevant poles engaging the conserved energy [1]. This indicates that atomic radius in different elements along with electronic structure of the atom is the core to elucidate what sort of the force-energy behavior is being considered by that atom.

Hardness at Mohs scale for different structures of different states carbon atoms at nanoscale is sketched in Figure 7. No value of hardness is counted when undertaking the gas state carbon atoms as they do not evolve structure at any scale. The hardness scale is related to the binding of different states carbon atoms where involved non-conserved energies due to electron-dynamics engaged their non-

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conservative forces, which is different for each established state of structure evolution of carbon atoms as noted above. In Raman spectroscopy, different values of wave number printed against energy signals of graphite structure and other structures of carbon (at nanoscale) reveal different nature of propagating photons through different inter-state electron gaps (in their different state carbon atoms), which is validated by the energy loss spectroscopy also [5].

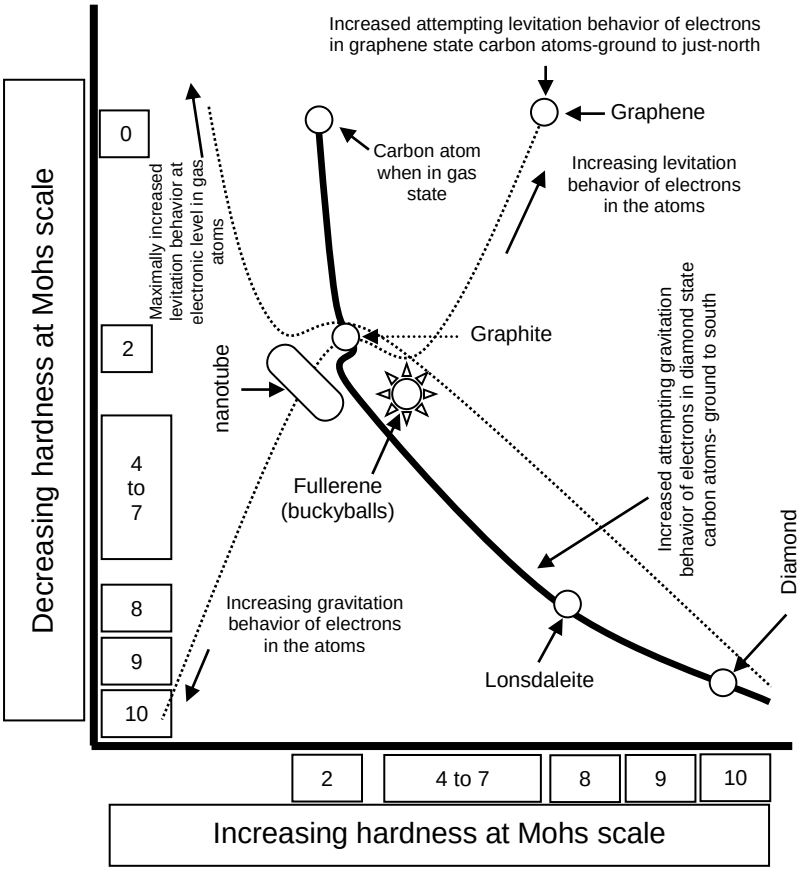

Figure 7: A sketch of approximately estimated hardness (at Mohs scale) of nanoscale structure in different states carbon atoms versus exerting levitational-gravitational force at electron levels

The involving non-conserved energy shape-like parabola in structure evolution of certain state carbon atoms, they work non-ecofriendly also because of involving the neutral behavior of exerting relevant poles forces, which also becomes the cause of non-conservation to environment. A carbon atom enables to understand the nature of electron-dynamics in atoms of different class of elements along with originating new physical behaviors of atoms. And then atoms of which elements involve first force to engage energy and atoms of which elements involve first energy to engage force. Carbon is not an overwhelming material all the times, more fairly, in the case of soft materials involving neutral behavior of forces on binding their atoms. But, it

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becomes outstanding when it is talked about the basic understanding of electron-dynamics for atoms of different class elements and in the structure evolution of hard carbon-based materials also.

3.0 Conclusions

Two units of energy shape-like parabola enable transferring of electrons from left-right sides to north-south poles of certain state carbon atom while maintaining the equilibrium state where exerting forces in respective format for relevant poles of those electrons work neutral. A carbon atom where two electrons of outer ring occupied sites at both left- and right-sides along the north-pole and remaining two electrons of outer ring occupied sites just below the line of east-west poles, it is related to gas state. In the carbon atom, when two electrons of outer ring retain positions in the states available at just above the line of east-west poles and two electrons of outer ring retain positions in the states available at just below to that line, it is related to graphitic state. A carbon atom where all the electrons of outer ring retain positions in the states at below east-west poles, it is related to diamond state.

When structure of graphitic state carbon atoms evolves two-dimensionally, it is under the application of attained dynamics only where difference to opposite pole forces in suitably amalgamated atoms regulate the structure. Forces exerting under the difference of poles of amalgamated atoms, if do not restrict them to bind under the engaged energies, at least, they also do not keep them from separating, once amalgamated under appreciably attained dynamics.

In bindings of graphitic, nanotube and fullerene state carbon atoms, the involved typical energies shape-like parabola engage the neutral behavior of exerting forces to relevant poles of transferring electrons, which mainly fall in the surface format. In the case where binding of graphitic state carbon atoms is under the execution of electron-dynamics, the evolution of structure is one-dimensional. Carbon atoms when are in nanotube state evolve two-dimensional structure where energy shape-like parabola involved for electrons in opposite quadrants of each atom engaging neutral behavior of exerting forces to their relevant poles. Carbon atoms when are in fullerene state evolve four-dimensional structure where energy shape-like parabola involved for all four quadrants of each atom engaging neutral behavior of exerting forces to their relevant poles also.

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In bindings of diamond, lonsdaleite and graphene state carbon atoms, the gained energy of electrons undertaking double clamping of energy knots is triggered by the orientationally-controlled exerting forces to their relevant poles. Bindings of diamond state carbon atoms are ground to south, but growth is south to ground where potential energies of orientating electrons engage the controlled behavior of exerting forces to their relevant poles. So, it is a tetra-electrons ground to south topological structure. Bindings of lonsdaleite state carbon atoms are ground to just-south, so, it is a bi-electrons ground to just-south topological structure. Bindings of graphene state carbon atoms follow opposite mechanism to the one for diamond state carbon atoms where potential energies of the orientating electrons engage the controlled behavior of exerting forces to their relevant poles both in the space and surface formats instead of the surface and grounded formats. So, it is a tetra-electrons ground to just-north topological structure.

Repeated sequence of tri-layers (gas, graphitic and lonsdaleite state carbon atoms) evolves structure of glassy carbon. In the structure evolution of glassy carbon, the electrons undertaking double clamping of the energy knots are entered from the rear-side (bottom) in the case of layer of gas state carbon atoms and from the front-side (top) in the case of layer of lonsdaleite state carbon atoms. Binding atoms of each layer of lonsdaleite state to atoms of each layer of graphitic state is under attempting forcefully levitation behavior of electrons where because of their decreased (lost) potential energy resulting into undertake another clamping of energy knots. So, the engagement of orientationally-controlled exerting forces of relevant poles to paired-electrons is from the front-side. Binding atoms of each layer of gas state to atoms of each layer of graphitic state is because of the attempting forcefully gravitation behavior of electrons where because of their increased (gained) potential energy, they result into undertake another clamping of energy knots. Here, the engagement of orientationally-controlled exerting forces of relevant poles to paired-electrons is from the rear-side.

Force and energy work inter-changeably; when force is involved then energy is engaged, but when energy is involved then force is engaged. The matter remains as the intermediate component identifying the functioning of force and energy. To originate the different physical behavior of each state carbon atom, non-conserved energies involve engaging non-conservative forces, so, in the case of their structure

evolution. An involved typical energy in developing structures of surface format is non-conserved because it is a sub-part of conserved (discrete) energy of a unit-photon shape-like Gaussian distribution with both ends turned. However, for structure evolutions of diamond, lonsdaleite, graphene and glassy carbon, a transitional potential energy of electrons involved engaging orientationally-controlled exerting forces when double clamping of energy knots is undertaken to them. Each state carbon atom elaborates its own science and, so, in binding of different states carbon atoms.

These investigations lead into present the origin of science and technology at clear grounds opening new areas of research on different lines as compared to the existing ones. These investigations enable one to understand different phenomena related to optics and photonics, certain force-energy behaviors of atoms of different elements, designing of new materials and light-matter interactions along with many others.

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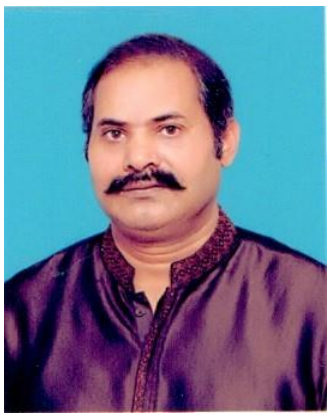

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