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Article

Atomic Structure and Binding of Carbon Atoms

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Abstract: Many studies discuss carbon-based materials because of the versatility of carbon elements. Depending on the processing conditions of a carbon precursor, carbon changes state behavior. The electron transfer mechanism occurred to convert carbon from one state to another. In conversion, the dash-shaped energy bits involved transferring electrons to nearby unfilled states. The involved dash-shaped energy has partially conserved behavior. A transferring electron is also under partially conserved forces. Carbon atoms equally evolve and equally develop structures of one dimension, two dimensions, and four dimensions, respectively, when in the graphite, nanotube, and fullerene states. Here, the already associated dash-shaped energy bits bind the carbon atoms. A two-dimensional graphite structure or amorphous carbon structure also forms. The structural formations in diamond, lonsdaleite, and graphene state atoms involve different shaped bits of energy. The bit of energy has a shape like a golf stick. By involving four bits of golf-stick-shaped energy, all four electrons of the outer ring of the depositing diamond state atom undertake an additional clamp of all four energy knots of the outer ring of the deposited diamond state atom. A depositing diamond state atom binds to the deposited diamond state atom from the east-west surface to the south. Growth is from the south to the east-west surface, so the structure of the diamond is a tetra-electron topological structure. The lonsdaleite state atoms bind from the surface east-west to a bit south. However, in glassy carbon, the layers of gaseous, graphite, and lonsdaleite state atoms bind simultaneously. The order of these layers repeats in the growth process of glassy carbon. The carbon-based materials also study Mohs hardness.

Keywords: Carbon; Atomic structure; Electron dynamics; Potential energy; Binding

1.0. Introduction

New strategies are required to process and synthesize carbon-based materials in selective sizes. A new science at both primary and applied levels can explore from the characterizations and analyses of carbon-based materials. A force exerting at the electron level should also explain the role of energy at the electron level [1-3].

In the structural formation of those carbon atoms where partially conserved energy involves at the electron level, a partially conserved force should also engage at the electron level. It should be a case in graphite, nanotube, and fullerene state atoms.

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In the structural formation of those carbon atoms where non-conserved energy involves at the electron level, a non-conserved force should also engage at the electron level. It should be a case in diamond, lonsdaleite, and graphene state atoms.

In the carbon atoms where neither energy involves nor force engages at the electron levels, force energy, a chemical in nature, should together contribute to form a structure.

The involvement of the energy at the electron level directs the force to engage at the electron level. The same can be the case at atomic and nano levels.

The outer ring electrons of any state carbon atom do not entertain a conservative force because of having a very close distance to the center. The nature of the involving energy should depend on the behavior of a carbon atom. In the literature, several studies discussed the different states of carbon.

When the conservative forces exert on the electron in a silicon atom, an uninterrupted execution of its dynamics generates a photon of unending length [2]. It indicates that the built-in interstate gap of electron dynamics in the carbon atom differs from silicon. Both carbon and silicon atoms possess equal numbers of filled and unfilled states in the outer ring. However, electrons of the outer ring in the carbon atom display different distances from the electrons of the outer ring in the silicon atom.

Gaseous and solid atoms deal with the transitions while undertaking the liquid states, where the electrons remain within their occupied energy knots [3].

The atoms which execute confined interstate electron dynamics evolve structure instead make it or developing it [4]. Atoms belonging to all elements do not ionize [5]. Carbon films in tiny-sized grains got deposited due to the synthetic protocol [6]. Carbon films of different morphology of grains got deposited because of varying process conditions [7].

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At different chamber pressures, the deposition of the carbon films shows different morphology and structure [8]. At different inter-wire distances, a carbon film was deposited in diamond and graphite phases [9]. Thus, the electron transfer mechanism is responsible for changing an atom's chemical nature regardless of whether it belongs to the same element.

The force entering from the north pole and leaving the ground surface for the south pole behaves differently than the force at the ground surface [10]. A recent study shows the transformation of graphene film into a diamond-like carbon film, where the elastic deformations and chemical natures were changed [11]. Wu *et al*. [12] reviewed the developments in Raman spectroscopy of graphene-based materials.

Carbon nanofibers were grown without a catalyst using a vapor deposition method [13]. Different applications related to graphene hybrids were reviewed [14]. Nitrogen-incorporated carbon dots merged to modify a glassy carbon electrode [15].

A novel energy dissipation system was investigated by gathering the features of both carbon nanotubes and buckyballs [16]. Different carbon allotropes, in comparison, were studied for dehydrogenation of temperature [17].

Precise positioning of the vacancies in a diamond crystal was studied [18]. Liu *et al*. [19] presented an efficient strategy to fabricate the graphite-graphene Janus architecture. Repeating large-area nanocrystalline diamond layers prepared under the optimized conditions of the deposition system [20].

Cheng and Zong [21] observed a structural evolution of damaged carbon atoms for a deeper surface layer. Maruyama and Okada [22] investigated the electronic and magnetic structures of a two-dimensional network of carbon atoms. Narjabadifam *et al*. [23] studied carbon nanocones' elastic and failure properties through molecular dynamics simulation. Levitated nanodiamonds burn in the air because of the amorphous carbon on their surfaces [24]. Uncertainty in the temperature measurement of levitated nanodiamonds was removed [25].

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These studies cover different ideas and discuss them within the scientific scope and application.

The current study discusses the formation of different states of carbon atoms along with their binding mechanisms. The present work also discusses the formation mechanism of the glassy carbon structure.

2.0. Experimental details

Many studies published on the topic describe the experimental details. To deposit carbon films is extensively discussed in the literature. Several techniques are studying the deposition of carbon films.

However, there is a need to optimize the processes of all sorts of depositions and syntheses. The earlier published studies on carbon-based materials can also help in many ways.

The focus of the current study is to explore the underlying science of the formation of different allotropes in a carbon element.

The discussed science here is the requirement of every study focusing on carbon-based materials in any form. The current study also charts the Mohs hardness of the different nanostructured and microstructured carbons.

3.0. Results and Discussion

3.1. Carbon lattice, different carbon states, and electron transfer mechanism

Different state carbon atoms rely on the same number of electrons. A carbon atom has a fixed number of filled and unfilled states in any state. Changing the position of the electrons gives birth to the new chemistry of that atom.

When the intercrossing of photons forms the twelve energy knots, they shape the carbon lattice. In intercrossing, overt photons keep the centers of their lengths at a common point. Overt photons keep equal lengths. Figure 1 (a)

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shows the lattice of a carbon atom. Two energy knots from each side of the center remained compressed from the neighboring states.

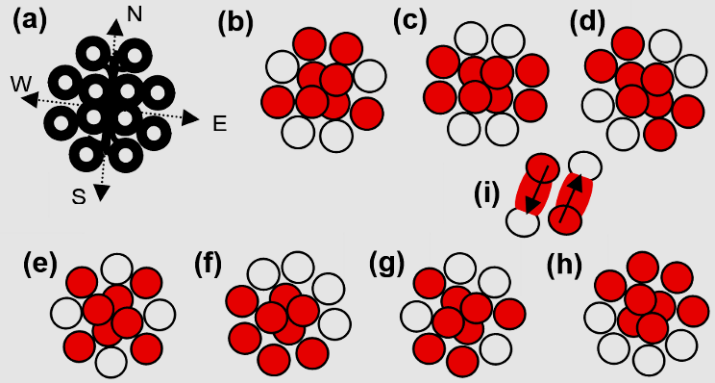

Figure 1: (**a**) Lattice of a carbon atom, atomic structure of carbon atom when in the (**b**) gaseous state, (**c**) graphite state, (**d**) nanotube state, (**e**) fullerene state, (**f**) diamond state, (**g**) lonsdaleite state, (**h**) graphene state, and (**i**) electron transferring to downward state and electron transferring to upward state (red circles indicate filled states, and white circles indicate unfilled states)

The lengths of the overt photons are so that their schedule crossing shapes the filled and unfilled states required to construct the energy-knot-net of a carbon atom. Two pairs of overt photons, which have characteristics of photonic current, intercross along the east and west sides. Two pairs of photons, which have characteristics of photonic current, intercross along the north and south lines. All the intercrossed overt photons keep the positions of their mid-lengths at the same point. The lattice of a carbon atom is related to the energy-knot-net, as shown in Figure 1 (a). The overt photons preserve their force by wrapping the energy [2].

In the outer ring, four states remained filled, and four remained vacant. This order of the states provides the option to originate six different states of the carbon atom in addition to the gaseous state and glassy carbon. Figure 1 shows (b) gaseous, (c) graphite, (d) nanotube, (e) fullerene, (f) diamond, (g) lonsdaleite, and (h) graphene state atoms, respectively. In each state, four-centered electrons form the zeroth ring. The zeroth ring is related to the helium atom [3]. Figure 1 symbolically shows the electrons and energy knots in different states of carbon atoms.

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When the gaseous carbon atom converts into the graphite state atom, the engaged forces are mainly related to the surface and space formats. The transferring electrons of the graphite atom convert it into the lonsdaleite atom. A bit of dash-shaped energy along the west to south involved. A bit of dash-shaped energy along the east to the south involved. The exerted forces on the transferring electrons remain partially conserved, related to the surface and grounded formats. Two electrons are transferred to the nearby positioned unfilled states to convert the lonsdaleite atom into the diamond atom. The ground point in the diamond atom goes further below the ground surface than the ground point in the lonsdaleite atom. A carbon atom fully expands under its diamond state.

Figure 1 (i) shows an electron of a filled state transferring to the nearby unfilled state. Dash-shaped energy is like a pipe through which force can see. Dash-shaped energy from one end connects to the tip of transferring electron and from the other end connects to the nearby unfilled state. Figure 1 (i) shows the downward arrow increasing the potential of the electron and the upward arrow decreasing the potential of the electron. The expansion and contraction of carbon atoms under different states depend on the electrons' potential energy and orientation force.

3.2. Formation of graphite structure

3.2.1. Formation of graphite structure under the electron dynamics of carbon atoms

Figure 2 (a) shows the binding of the carbon atoms in the graphite state. Atom A binds to Atom B and Atom C by involving the dash-shaped energy of two bits. Atom B and Atom C bind to Atom A from both sides. The exerted forces remain in the partial conservative mode in transferring electrons. Figure 2 (a) shows the nucleation stage of a one-dimensional graphite structure.

A nucleated structure of graphite grows by further binding the graphite state atoms. The graphite structure nucleated along the same axis. Figure 2 (a) also shows the layer of the graphite structure from the rear side.

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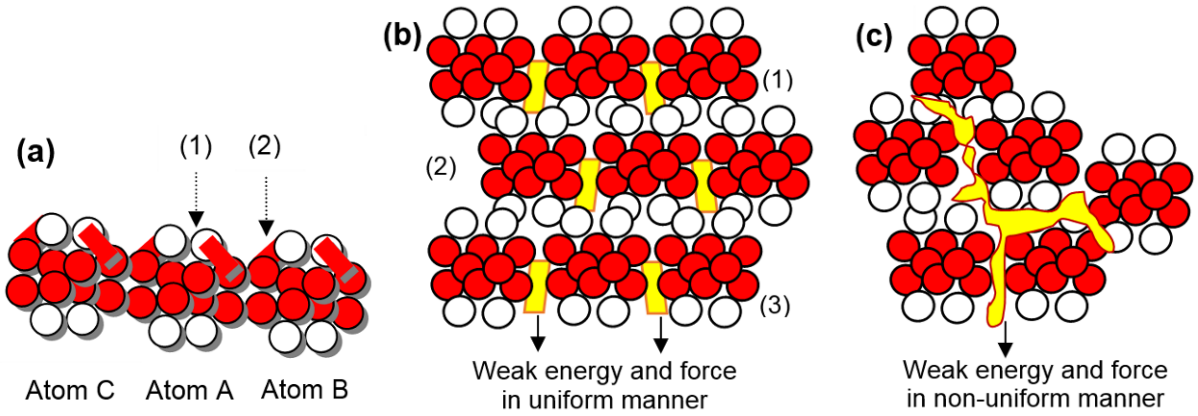

Figure 2: (**a**) Formation of graphite structure under interstate electron dynamics (1) unfilled state of a transferred electron and (2) involved dash-shaped energy, (**b**) formation of graphite structure when weak energy contributed under uniformly attained dynamics of graphite atoms, and (**c**) formation of amorphous graphite structure when weak energy contributed under non-uniformly attained dynamics of graphite atoms

Under electron dynamics, a graphite structure grows in one dimension along the east and west poles. The binding graphite atoms can be from both sides of the X-axis. However, electrons of the bound atoms get their orientation along the same axis, which is also an adjacent orientation. The exerted forces on the electrons along the north-south poles almost diminish. In tiny grain carbon film, atoms of arrays elongate and convert into the structures of smooth elements [6].

The pieces of dash-shaped energy get involved in binding graphite atoms under their interstate electron dynamics. To transfer electrons from the left and right sides of the gaseous carbon atom in attaining the graphitic state, the sides' potential to transfer electrons from upper states to lower states increases. However, the potential in converting the gaseous carbon atom to the graphite state atom remains equal. Therefore, that atom maintains the equilibrium in the journey to get the conversion.

3.2.2. Formation of graphite structure under the attained dynamics of graphite atoms

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When carbon atoms amalgamate without executing the electron dynamics, they only bind through the attained dynamics. In this case, dash-shaped energy is no more involved in the binding of graphite atoms. The slight difference of forces remains along the east and west poles of just amalgamated graphite state atoms.

A slight difference in the forces between graphite state atoms facilitates keeping them bound as they were amalgamated only under the attained dynamics, which is shown in the arrays as labeled by (1), (2), and (3) in Figure 2 (b). Therefore, weak energy remains and keeps binding to the graphite state atoms.

Graphite state atoms naturally come into the order of two dimensions. The found force and energy among graphite state atoms bind them from east-west or west-east sides. Force and energy at the atomic level introduce the weak application to preserve the graphite structure. Due to uniformly attained dynamics in graphite state atoms, amalgamated atoms bind under uniform force and energy.

Therefore, when the force and energy, a chemical in nature, together contribute, a structure related to two dimensions is developed (or formed).

3.2.3. Formation of amorphous graphite structure or amorphous carbon structure

An amorphous graphite structure is when the amalgamation of graphite state atoms is under the non-uniformly attained dynamics. Atoms do not position exactly from the east-west sides or west-east sides. Figure 2 (c) shows the graphite state atoms bind under the non-uniformly attained dynamics where weak energy and force contribute. However, their contribution is in a non-uniform manner.

A structure of graphite state atoms can also be the amorphous carbon structure when the ground surface is not flat. Due to the amalgamation of graphite state atoms without order, force, and energy, a chemical in nature, contribute in

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non-uniform manners. Due to non-uniformly attained dynamics in amorphous graphite structure, amalgamated graphite state atoms also bind under the non-uniform force and energy.

In the formation of amorphous graphite structure, graphitic state atoms amalgamate under non-uniformly attained dynamics. However, weak force and weak energy are contributed together in a non-uniform manner.

3.3. Formation of nanotube and fullerene structures

A nanotube structure forms by converting the carbon atoms into the nanotube state atoms. A nanotube atom can convert from the fullerene state atom before binding. The transferring electrons to the appropriate unfilled states are under the involved dash-shaped energy in the conversion. A partial conservative force is engaged in the transfer of electrons.

Atoms of the nanotube state bind into a structure by involving partially conserved energy and engaging partially conserved force.

On one quadrant electron, forces exert in the space and surface formats. The forces exerted on the electron of the opposite quadrant remain in the surface and grounded formats. In this manner, the carbon atom keeps equilibrium during the conversion from one state to another.

A dash-shaped energy bit involves transferring the electron. So, carbon atoms having a nanotube state can bind to the central atom having a nanotube state. Figure 3 (a) shows atoms of the nanotube state bind to the centered nanotube atom from both sides. It is a nucleation stage of the nanotube structure. The nucleation of the nanotube structure can be under two options, as shown in Figure 3 (a). The nanotube structure forms two-dimensional.

The binding of atoms is not along the same axis. However, in the electron dynamics of graphite atoms, the binding is along the same axis line. The formation of structure in graphite atoms is considered one-dimensional.

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In the structural formation of the nanotube, the behavior of both energy and force remains partially conserved. Figure 3 (a) shows that two forces exert the electron in each case. However, further work is required.

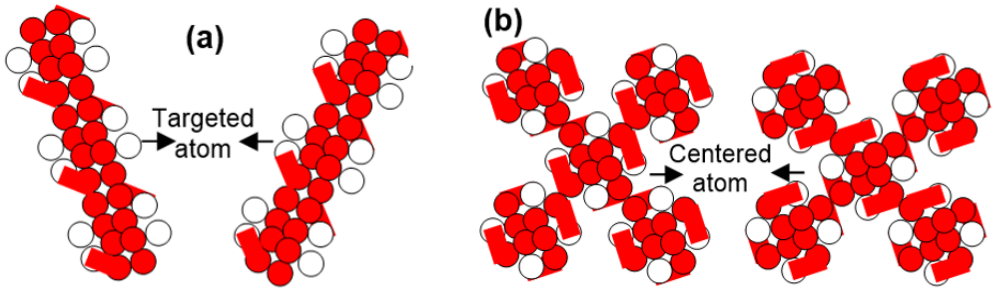

Figure 3: (**a**) nanotube structure in two different options and (**b**) fullerene or buckyballs structure in two different options

A carbon atom converts into a fullerene state atom on electron transfer for each dedicated position. Electrons of the outer ring (belonging to all four quadrants) involve energy shaped like a dash. So, transferring the electron of each quadrant engages the partial conservative force along the relevant poles.

Involved dash-shaped energy (at the electron level) binds fullerene state atoms for each quadrant of the centered fullerene state atom, as shown in Figure 3 (b). Figure 3 (b) shows the different nucleation of each fullerene-based structure.

In nucleating the structure, the fullerene state atoms bind to all four quadrants of the centered fullerene state atom. The structural formation in fullerene state atoms is four-dimensional. The exerting forces along the relevant poles of transferring electrons remain partially conserved.

Figure 3 (b) shows that two forces exert on the electron of each quadrant. In each case, electrons deal with the partial conservative forces depending on the involved dash-shaped energy bits.

Both energy and force, a chemical in nature, behave partially conserved in forming a fullerene structure. However, more work is required.

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3.4. Formation of a diamond structure

Figure 4 (a) shows a lonsdaleite state atom. The ground point of the lonsdaleite state atom is just below the ground surface.

Figure 4 (a) also shows a diamond state atom. The expected binding point of diamond state atoms, when the lonsdaleite state atom will convert into the diamond state, is also shown in Figure 4 (a).

A diamond atom deals with the maximum solid behavior. So, the ground point of the diamond state atom remains below the ground point of the lonsdaleite state atom. A diamond state atom first deposits at the suitably treated substrate to nucleate the diamond structure. Thus, the electrons of a deposited diamond state atom do not further gravitate. Again, due to the maximum achieved potential energy of the electrons, there is no more stretching of their occupied energy knots.

A lonsdaleite state atom is converted into the diamond state atom when electrons from the left and right sides transfer to the downward unfilled states. Energy knots clamped electrons in the converted diamond state atom also undertake the same stretch level as the deposited diamond state atom.

So, the orientationally controlled electrons of a depositing atom are also in the exertion of forces exerted in the surface and grounded formats. All electrons of the outer ring of the depositing diamond state atom are in a position to undertake one additional clamp of energy knot belonging to all unfilled states of the outer ring of the deposited diamond state atom, as shown in Figure 4 (b).

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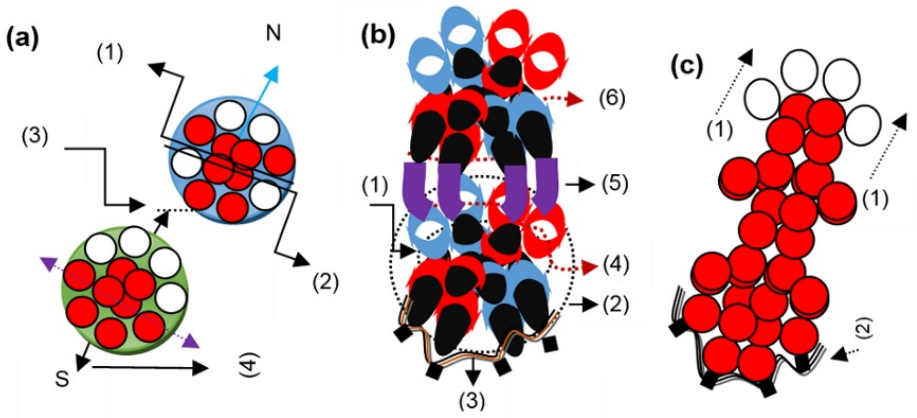

Figure 4: (**a**) Lonsdaleite state atom converting into diamond state atom (1) east-west surface, (2) ground point of lonsdaleite state atom, (3) estimated binding point of two diamond state atoms, and (4) ground point of the deposited diamond state atom, (**b**) binding of depositing diamond state atom to the deposited diamond state atom (1) zeroth ring of the deposited diamond state atom, (2) outer ring of the deposited diamond state atom, (3) substrate, (4) positioned or stretched energy knots of the outer ring of the deposited diamond state atom, (5) involved golf-stick-shaped energy for each electron of the outer ring of the depositing diamond state atom, and (6) targeted or aligned electrons of the outer ring of the depositing diamond state atom, and (**c**) diamond growth (1) south to east-west surface growth of diamond and (2) embedded electrons of the deposited diamond state atom

In a depositing diamond state atom, the left-positioned electrons orientated along the left side of the line drawn normal to the center, and the right-positioned electrons orientated along the right side of the line drawn normal to the center. The orientation of all electrons locates along the south side.

Figure 4(b) shows all four electrons of the outer ring of the diamond state atom obey nearly the same orientation. Orientation of the zeroth ring electrons adjusted accordingly. Figure 4 (b) also shows that the electrons of the outer ring of the depositing diamond state atom undertake an additional clamp of the energy knots of the outer ring of the deposited diamond state atom by involving the bits of golf-stick-shaped energy. In the structural formation of a diamond, exerting force on each electron also becomes non-conserved.

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Atoms of the gaseous and solid states, when in the original state behaviors, keep the orientation of the electrons ~ 40° along the north pole and 40° along the south pole, respectively [3].

Figure 4 (c) shows the growth behavior of diamonds. In the growth of the diamond structure, the expansion and contraction of the depositing and deposited atoms mutually adjust. Figure 4 (c) also shows the electrons embedded in the substrate surface in the first deposited diamond state atom. On having the maximum stretching of the occupied energy knots, electrons orientated along the east-west surface to the south under the non-conservative force. Thus, two diamond state atoms bind from the east-west surface to the south. It is the nucleation stage of a diamond. A diamond structure can grow with several faces.

In Figure 4 (c), red, white, and overlapped circles designate the filled states, unfilled states, and double clamping to the electrons, respectively.

On binding two diamond state atoms, the third diamond state atom comes into position to bind. Therefore, the growth of diamond is south to the east-west surface, but the binding of diamond state atoms is from the east-west surface to south. The binding of diamond atoms remains between the surface and grounded formats. Thus, the structural formation in diamond state atoms is related to the topological structure.

3.5. Formation of lonsdaleite and graphene structures

The ground point of the lonsdaleite state atom is a bit below the ground surface as it is below the ground point of the graphite state atom. Electrons of the lonsdaleite state atoms have lower potential energy than electrons of the diamond state atom. Hence, the energy knots are in the lesser stretch, so the lonsdaleite state atom is less expanded than the diamond state atom. A lonsdaleite state atom is mainly in a bit solid behavior.

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In structural formation, a lonsdaleite state atom also experiences the non-conservative force for two electrons under the involvement of non-conserved energy. Lonsdaleite state atoms bind from the east-west surface to a bit south, but the growth behavior is from (a bit) south to the east-west surface. However, further studies are required.

The ground point of the graphene state atom exists just above the ground surface. However, the levitational behavior of force is in a non-conserved manner. The binding of graphene state atoms experiences forces mainly in the surface and space formats. So, the growth of graphene structure is opposite to diamond.

The growth of graphene is east-west surface to the north. Principally, graphene state atoms should grow with a topological structure. Due to the limitation of forces in the surface and space formats, adherence to only a few layers in the graphene structure is possible. Further investigations are required to study the binding mechanism in graphene state atoms and the viability of associated forces.

3.6. Formation of glassy carbon structure

To nucleate the structure of glassy carbon, three layers of different states of carbon atoms bind successively. By binding simultaneously, layers of gaseous carbon atoms, graphite state atoms, and lonsdaleite state atoms nucleate the glassy carbon structure.

To grow the structure of glassy carbon, layers of gaseous, graphite, and lonsdaleite state atoms repeat in the same order. The bits of energy shaped like a golf stick or half of a parabola get involved in binding the different state atoms between the layers.

Layers of gaseous carbon atoms and graphite state atoms bind under the joint application of exerting forces in the grounded format and surface format. The targeted electrons of each gaseous state atom undertake one additional clamping of the targeted energy knots of each graphite state atom, which is from the rear side shown in Figure 5. Thus,

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gaseous carbon atoms attempt an aggressive gravitational behavior under the increased potential energy of the electrons.

Layers of lonsdaleite state atoms and graphite state atoms bind under the joint application of exerting forces in space and surface formats. The targeted electrons of each lonsdaleite state atom undertake one additional clamping of the targeted energy knots of each graphite state atom, which is from the front side shown in Figure 5. By decreasing the potential energy of electrons, lonsdaleite state atoms attempted an aggressive levitational behavior.

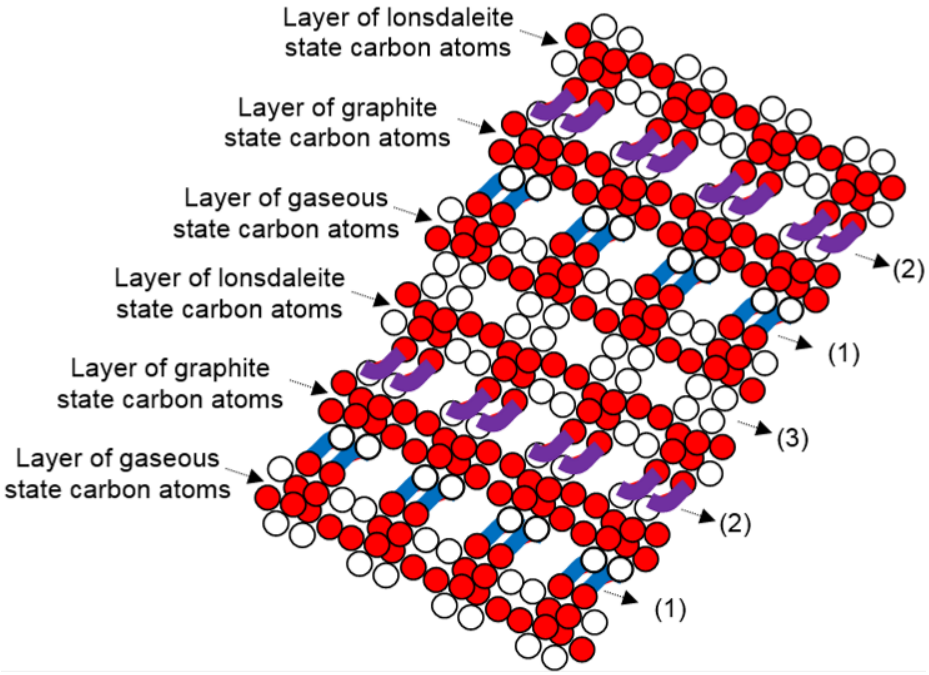

Figure 5: Formation of glassy carbon structure where layers of gaseous carbon atoms, graphite state atoms, and lonsdaleite state atoms bind successively

Binding gaseous state atoms of each layer to the graphite state atoms of each layer involves oppositely J-shaped energy, also called golf-stick-shaped energy. The clamping of each pair of unfilled energy knots to the half-length of each pair of electrons is from the rear side. The label (1) in Figure 5 shows the binding between the gaseous state and graphite state atoms.

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Binding lonsdaleite state atoms of each layer to the graphite state atoms of each layer involves J-shaped energy, also called golf-stick-shaped energy. The clamping of each pair of unfilled energy knots to the half-length of each pair of electrons is from the front side. Label (2) in Figure 5 shows the binding between the lonsdaleite state and graphite state atoms.

Label (3) in Figure 5 indicates the compensation in expansion and contraction of gaseous and lonsdaleite state atoms while binding their (upper and lower) layers with the intermediate layer of graphite state atoms.

3.7. Mohs hardness of carbon materials estimated graphically

In Figure 6, the Mohs hardness of different nanostructured and microstructured carbon materials is an estimation. Gaseous carbon atoms do not even form a soft structure, so gaseous carbon atoms keep the hardness zero at the Mohs scale.

In the structures of graphite, nanotube, and fullerene state atoms, the involving partially conserved energy and engaging partially conserved force measure the hardness only near to the average scale of Mohs hardness.

However, in the structures of lonsdaleite, graphene, and glassy carbon, the involvement of non-conservative energy and the engagement of non-conservative forces measure the hardness at a large scale.

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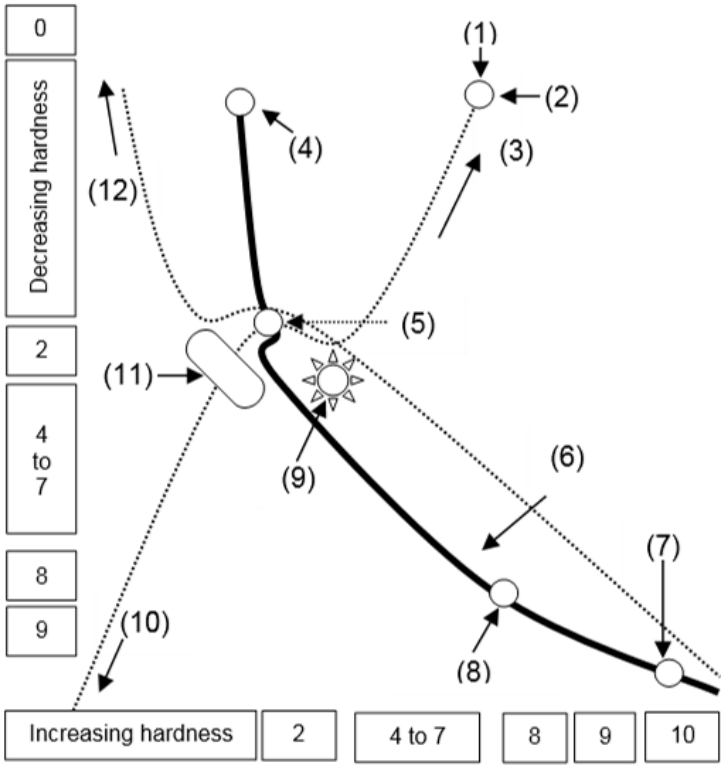

Figure 6: Mohs hardness of carbon nanostructured and microstructured vs. engaged forces at the electron level; (1) levitational force in graphene state atoms, (2) graphene state atoms, (3) increasing levitational force at the electron level, (4) gaseous state atoms, (5) graphite state atoms, (6) increasing gravitational force at the electron level, (7) gravitational force in diamond state atoms, (8) lonsdaleite state atoms, (9) fullerene state atoms, (10) maximally increased gravitational force, (11) nanotube state atoms, (12) maximally increased levitational force

The high hardness of lonsdaleite, graphene, and diamond structures is due to the involvement of golf-stick-shaped energy bits. In the structural formation of hard carbon materials, the energy shaped like a golf stick is involved in controlling the process of undertaking double clamping of energy knot by each targeted electron of diamond, lonsdaleite, and graphene state atoms. Hence, targeted electrons undertaking double clamping of energy knots engage a non-conservative force.

The same is the case in the structural formation of glassy carbon, where layers of gaseous, graphite, and lonsdaleite state atoms bind successively.

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Heat treatment improves the mechanical properties of carbon films deposited by magnetron sputtering [26]. A carbon nanotube film improves electrode stability [27]. Carbon films are deposited in a pulse-based CVD system to improve tribological properties [28]. By establishing covalent bonds between the substrate and carbon film, the electronic states of carbon-based materials are controlled [29]. The relation of different parameters with the formation of carbon films was studied [30]. High negative bias voltages reduce the hydrogen content in depositing carbon film [31].

An enhanced thickness of the carbon film does not remain beneficial for all purposes [32]. The structure and electrochemical properties of carbon films deposited by the electron cyclotron resonance sputtering method have been discussed elsewhere [33]. A graphitic phase of deposited carbon films reduces the friction coefficient in the vacuum medium [34]. Carbon films having lowered hydrogen content were deposited by tuning the ratio of the graphitic phase to the diamond phase [35].

A nano-indentation behavior of a single-walled carbon nanotube has been discussed elsewhere [36]. Carbon nanotube thin film deposited by the floating catalyst CVD technique offers potential application as a thin film transistor [37]. Carbon nanotube films discussed their high thermal conductivity [38]. A recent study suggests photochemically conversion of graphitic phase into diamond phase [39]. It is not possible to cite every study though there are many studies.

However, it is an acute need to study carbon films along with different carbon-based materials not only in structural behavior but also in force energy behavior. The characterizations and analyses of carbon films should discuss as per depositions.

4.0. Conclusion

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None of the carbon states refer to impartial or neutral force behavior at the electron level. In the electron transfer mechanism, a pair of dash-shaped energy involves transferring a pair of outer ring electrons to suitable unfilled states. A carbon atom maintains its equilibrium state during the electron transfer mechanism.

When the graphite state atoms form a two-dimensional structure, it is only under the attained uniform dynamics. The weak force and energy together contribute to binding the graphite state atoms. They contribute uniformly. However, in the formation of amorphous graphite structure, these are not contributed uniformly.

The graphite state atoms form a one-dimensional structure when executing interstate electron dynamics. The nanotube and fullerene state atoms form two-dimensional and four-dimensional structures.

Carbon nanotube structure nucleates from the interstate dynamics of the opposite quadrant electrons. By involving the bits of dash-shaped energy, binding four fullerene state atoms to all four quadrants of the targeted atom nucleates the fullerene structure.

Bits of partially conserved dash-shaped energy involve at the electron level by engaging the partially conserved force in the formation of graphite, nanotube, and fullerene structures.

In the nucleation and growth of diamond, lonsdaleite, and graphene structures, non-conservative energy involves engaging the non-conservative force at the electron level. Each outer ring electron of the depositing diamond state atom undertakes an additional clamping of the outer ring energy knot of the deposited diamond state atom. Here, a bit of energy shaped like a golf stick involves transferring the electron up to half-length to another energy knot. The half-length electron above the clamped energy knot remains under the exposure of force.

The binding in diamond state atoms remains from the east-west surface to the south, so the growth behavior remains from the south to the east-west surface. It is a tetra-electron topological structure.

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The binding in lonsdaleite state atoms remains from the east-west surface to a bit south, so the growth behavior remains from a bit south to the east-west surface. It is a bi-electron topological structure.

Layers of gaseous, graphite and lonsdaleite state atoms repeat under the same order, and a glassy carbon structure grows. In binding atoms in a glassy carbon structure, the targeted electrons of the gaseous and lonsdaleite state atoms undertake additional clamping of the positioned energy knots of the graphite state atoms.

The structural formation in graphite, nanotube, and fullerene is first by involving the partially conserved energy and then by engaging the partially conserved force. These structures equally evolve and equally develop in the formation.

The structural formation in diamond, lonsdaleite, and graphene is first by involving the non-conserved energy and then by engaging the non-conserved force. The same is the case in the structural formation of glassy carbon. In these structural formations, the suitable electrons of atoms execute interstate dynamics by remaining non-confined.

The hardness property in carbon-based material should relate to the energy and force, chemical in nature, introduced at the electron level.

In the structural formation of carbon atoms, energy is involved first to engage the force in exploring their science. Studying carbon materials from the perspective presented here opens new areas of investigation. They can enable us to understand the different phenomena of nature.

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Conflicts of interest:

The author declares no conflicts of interest.

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This work is based on the fundamental nature of science.

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