CHEMICAL ACTION

According to 'MATTER (Re-examined)'

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Abstract: Atoms are stable and self-stabilizing 3D matter-bodies, which spin about their nuclear/atomic axes. Unless in extreme conditions or due to accidents, no part of an atom may be removed from it, and under no circumstances may additional parts be included in the structure of a stable atom. Atoms of all elements (except those of inert elements) have resultant external fields about them. Complementary atoms arrange themselves to form groups until most of their resultant external fields are inhibited by the rotary motion of the atoms in planes across their atomic axes. Molecules form crystals and other groups in a similar manner for the same purpose. In order to form different combinations of atoms and/or molecules, it is necessary to break present bonds between atoms or between molecules by varying their rotary speeds to enable their resultant external fields to be effective and form different kinds of groups (molecules, crystals, etc.). These actions are generally known as chemical actions.

Keywords: Universal medium, fields, atoms, molecules, chemical action.

Introduction:

An alternative concept, proposed in the book 'MATTER (Re-examined)', envisages an all-encompassing universal medium, structured by quanta of matter, that fills the entire space outside most basic three-dimensional matter-particles. Self-stabilizing property of its structure enables the universal medium to apply external compression on the convex surfaces of all basic three-dimensional matter-particles. This phenomenon is the gravitation. The magnitude of gravitational pressure depends on the extent of the universal medium in the direction from which the pressure is applied. The extent of universal medium between two basic 3D matter-particles is always less than the extent of universal medium on their outer sides. Therefore, greater gravitational pressure from the outer sides against smaller gravitational pressure from between these bodies compels them to move towards each other. This action is understood as the (apparent) gravitational attraction.

Universal medium is a combination of two-dimensional latticework structures by quanta of matter. A structurally deformed region in the universal medium is a field. Fields are classified according to the nature of structural distortions in them. The nature of structural distortions is indicated by imaginary lines of force. Circular lines of force indicate an electric field, linear lines of force indicate a magnetic field, and radial lines of force indicate a nuclear field. An electric charge is nothing but the relative direction of lines of force in an electric field. Clockwise lines of force indicate positive electric charge, and anti-clockwise lines of force indicate negative electric charge. Hence, all electric fields have both positive and negative electric charge, and the nature of electric charge depends on the direction of observation. Zilch-effort distance is the distance between the centres of curvatures of lines of force of two electric fields at which they produce no interactive efforts. Due to the 2D nature of fields, two fields can interact only when they are in the same plane and within interacting range. Different fields in the same plane may interact to produce inertial efforts on the corresponding 3D material bodies about which these fields are present.

Should one of the interacting fields turn away from the common plane of the fields, or if two fields rotate mutually about each other in a plane perpendicular to the common plane of the fields, they cannot interact. Interactive efforts develop only when their planes coincide. During the rotary motion of an electric field (in a plane perpendicular to its plane of existence), interaction with another static electric field takes place only twice every turn. Rapid rotary motion of an electric field with respect to another static electric field or rapid relative rotary motions of two electric fields about each other (across their axes) vary/nullify their average interactive

efforts. Hence, the average inertial effort produced by the interaction of rotating fields depends on the angular speeds of the fields.

It may be generally stated that the sense of interactive effort between two fields depends on their natures, and the magnitude of interactive effort depends on the distance between the fields. However, the direction and the magnitudes of interactive efforts (forces) between two electric fields depend not only on the type of electric fields (electric charges) but also on the distance between them. Within zilch-effort distance, similar electric charges repel each other and dissimilar electric charges attract each other. Beyond zilch-effort distance, similar electric charges attract each other and dissimilar electric charges repel each other. At zilch-effort distance between them, two electric fields do not produce interactive effort.

The universal medium creates disc-shaped 3D matter-cores by gathering free quanta of matter available in the gaps in its structure (by gravitational actions). They are moved linearly at the highest possible (hence constant) speeds and spun about one of their diameters by the structural distortions formed in the surrounding universal medium. Linearly moving and rotating structural distortions around the 3D matter-core have many similarities with EM waves. Disc-shaped 3D matter-core and the linearly moving rotating structural distortions about it in the universal medium, together, form the most basic 3D matter-particle - a photon (a corpuscle of radiation). The 3D matter-core of the corpuscle gives a photon its particle nature, and the structural distortions about it in the universal medium give the photon its wave nature.

Under gravitational attraction, two complementary photons (moving in a common circular path and spinning in unison at their critical speeds) form a primary 3D matter-particle (biton). Bitons, in various combinations, form all other superior 3D matter-particles and macro bodies. Linear and spin motions of photons in a common circular path in a biton distort the structure of the surrounding universal medium, circularly. The field created by the circular structural distortions in the universal medium is a primary electric field. Formation of superior 3D matter-particles by bitons arranges constituent primary electric fields in different patterns to yield different types of resultant distortion-fields about a 3D material body to form its matter-field.

Atomic nuclei are very robust structures. No constituent may be removed from or added to the structure of an atom under stable conditions. Chemical actions take place without structural changes to the atoms. Constituent atoms, participating in a chemical action, maintain all their constituents, individual characteristic properties, and parameters, including the number of constituents and their relative arrangements. All conclusions expressed in this article are from the book 'MATTER (Re-examined)' [1]. For details, kindly refer to the same.

Structure of Atom:

When two 3D material bodies are near, their matter-fields interact to produce (electric, magnetic, and/or nuclear) field-efforts. Constituent 3D matter-particles of an atom group together under gravitational attraction. When they are within range, corresponding fields about them also take part in actions to form and stabilize the atoms. Except for very few very large types of atoms, all others are self-stabilizing 3D material bodies and have almost infinite life.

Atomic nuclei:

Nuclei of all atoms (except hydrogen) are formed by deuterons. A deuteron is formed by the combination of two neutron-like single-layered spherical shells about a positron in the middle. Each deuteron is presently counted as one proton + one neutron. A single neutron-like spherical shell formed on one side of a positron makes the combination a proton. Only in a few cases are protons and neutrons included as nucleons. Neutrons are used to fill vacant spaces in nuclear structure or where their presence is required as balance weights to stabilize nuclear spin motion.

In nuclei of larger atoms, nucleons form a number of (single-layered) circular sections. Nucleons in different orientations in circular arrangements produce different resultant fields about them. Depending on the numbers and arrangement of nucleons, each nuclear section may be of different girth and have a different resultant field about it. Availability of nuclear sections and their relative field properties guide them to attach with each other side-by-side to form a tubular structure, centred along (imaginary) nuclear axis. Different numbers of circular arrangements by nucleons of different girths, together, form a nucleus. Nuclei (especially in smaller atoms) may have one or more nucleons, in one or more sections, placed on their nuclear axes. As long

as free nucleons are available in a region, the development of static nuclei will continue to include more and more of them in their structures.

Development of atom:

The first orbital electron that approaches a (developing) nucleus starts to spin the nucleus in either direction about the nuclear axis by repeatedly transferring angular momentum (work) to the matter-field of the nucleus. A difference in the direction of spin produces allotropic properties of atoms. Commencement of spin motion stops further development of the nucleus and determines the type of atom formed. Only those formations of nuclei that can survive the stress due to spin motion can become part of an atom.

All further additions of orbital electrons will conform to the direction of nuclear spin. The number of orbiting electrons about any nuclear section is strictly equal to the number of positrons in that nuclear section. An orbiting electron and its corresponding positron in the nuclear section will always be in alignment and in phase with each other. By this arrangement of the orbiting electrons, they form another circular formation around each nuclear section. Orbital electrons around all nuclear sections, together, form another tubular structure outside and enveloping the nucleus. As a single unit, the nucleus of an atom floats inside its electronic envelope. Alignment of the atomic axis (central axis of electronic envelope) and the nuclear axis is maintained automatically by interactions between corresponding fields of the nucleus and the electronic envelope. Angular deflection between the atomic axis and nuclear axis produces a resultant electric field (electric current) about the atom. Should the atomic axis deflect angularly, the nucleus automatically follows the electronic envelope until the nuclear axis aligns with the atomic axis. Angular deflection of the atomic axis of an atom with respect to the atomic axes of neighbouring atoms is the atom's electric potential.

Internal electromagnetic actions of an atom take place between the fields from its nucleus and the fields about its electronic envelope. External electromagnetic actions by/on atoms are dominated by the exterior fields about their electronic envelopes. Orbital motions of electrons appear as spin motion of the electronic envelope. Spin motions of the nucleus and electronic envelope endow them with gyroscopic properties. Depending on the relative arrangements of (nucleons and) orbiting electrons, the residual external resultant field about an atom may differ in nature, direction, and field-strength at different regions around the atom.

Chemical action:

Participant elements in a chemical action are the reagents. Most types of atoms (except those of inert elements) exhibit some sort of resultant external distortion-field about them. To stabilize their co-existence with other atoms by inhibiting resultant external distortion-fields about them, these atoms are compelled to form unions with matching atoms and stay together as stable molecules. Similar processes are repeated in cases of molecules with resultant external distortion-fields to form crystal (and other types of) formations. A similar combination process will continue (if possible) until the resulting 3D material body has no effective resultant external distortion-field about it.

Superior 3D matter-particles (molecules/crystals/etc) of each reagent are individually stable, and their distortion-fields have no resultant external distortion-fields about them. However, bringing two or more non-complementary 3D matter-particles nearer to manipulate their distortion-fields or to change their 3D matter-content levels may destabilize the distortion-fields of one or more participants. Destabilizing the distortion-field of a molecule/crystal disturbs the spin and rotation patterns of individual atoms in it to reduce or remove bonds between them. This may release individual atoms from the present molecular formation and enable them to form a molecule with more suitable atoms under the present conditions.

Residual resultant external distortion-fields about an atom prevent its independent existence. The atom is bound to search and form a group with any other atom (of its own kind or of a different kind) or atoms until the magnitude of all resultant external distortion-fields (except magnetic fields in special cases) in the group is inhibited. Groups formed by the atoms to neutralize each other's resultant external distortion-fields are the molecules. Bonds between constituent atoms of a molecule may be dissolved by manipulating the molecule's distortion-field or its 3D matter-content level. Once the bonds between member-atoms of molecules in a compound are broken, constituent atoms become free to re-form into the same alliance or to form an alliance with any other type of complementary atoms available in the vicinity. This process is a chemical action or reaction. Chemical actions may be temporary, permanent, reversible, or irreversible.

Bitons are the primary 3D matter-particles. Constituent photons of a biton move at the linear speed of light along a common circular path and spin in unison about a common axis. An attempt to bring these photons nearer by external pressure compels their 3D matter-cores to lose parts of their 3D matter-contents and expand the biton's radial size. This phenomenon, in turn, causes the expansion of a 3D material body. This process is the heating. The reverse process is cooling. Changes in the 3D matter-contents of constituent bitons of a body change the magnitude of the body's distortion-field. Changes in the 3D matter-contents of bitons also change the magnitude of gravitational attraction on it. As the linear speeds of photons do not vary, the primary electric field about a biton remains more or less steady.

Manipulation of matter-fields of reagents in a chemical action may be performed by heating (lowering 3D matter-content level), by cooling (increasing 3D matter-content level), by increasing or reducing external pressure, by the presence of a suitable catalyst in the vicinity, or by changing any other factor that may alter the matter-field in a suitable way.

Catalysis:

Catalysis is the change in the rate of a chemical reaction due to the presence of a substance called a catalyst. Unlike other reagents, a catalyst participating in a chemical action is not consumed during the chemical action itself. A catalyst may participate in multiple chemical transformations. Catalysts that accelerate the chemical action are positive catalysts (or promoters). Catalysts that slow down a reversible chemical reaction are called inhibitors (or negative catalysts), and those that slow down an irreversible chemical reaction are called catalytic poisons. Although catalysts are not consumed directly in a chemical reaction, they may be inhibited, deactivated, or destroyed by secondary processes during a chemical reaction. Catalysts that participate in chemical reactions in biology are called enzymes.

A catalyst works by modifying the environment in and about the reagents. Combining the distortion-fields (matter-fields) of the catalytic agent with those of reagents, overall distortion-density and relative directions (hence nature of distortion-field) of structural-distortions in the universal medium about the region (matter-field) are modified appropriately to suit the requirement, without suffering changes to its own matter-field.

Mechanism of chemical action:

Mechanism of chemical action may be illustrated by the formation and dissolution of an imaginary homonuclear molecule formed by two atoms, whose relative spins are in opposite directions (shown by thick grey curved arrows). Figure 1 shows ideal conditions for two atoms of the same element with dissimilar relative spin motions. Each of the atoms has four nuclear sections shown by thick ellipses centered along the nuclear axis, xx. Ellipses in dashed lines enclosing the nuclear sections are electronic envelopes. Three of the nuclear sections and their electronic envelopes are smaller than the fourth nuclear section and its electronic envelope. Due to the uneven distribution of 3D matter-particles, the centre of gravity of the atom is displaced from the geometrical centre of the nuclear axis. Gravitational attraction, g, between two atoms M_1 and M_2 may be considered to act through their centers of gravity, as shown by thin black arrows, g. However, electric fields due to the nucleons and orbital electrons are distributed somewhat evenly, and hence the resultant interaction between them may be considered to act through the geometrical centre of the nuclear axis, as shown by the arrows, e, in thin dashed lines.

Due to identical directions of spin motion of nuclear sections and electronic envelopes in individual atoms, structural distortions produced in the universal medium along the atomic axis about any atom are circular (electric field) in the same direction as the direction of motion of orbital electrons, in planes perpendicular to the atomic axis (shown by grey curved arrow). Atoms M_1 and M_2 spin in opposite directions, as shown by thick grey arrows in Figure 1. Therefore, their electric fields are dissimilar to each other.

Figure 1 shows the atoms before and during their stable molecular formation. In a region where complementary atoms are present, atoms are gravitationally attracted towards each other. In the course of their natural movements, these atoms may align so that their atomic axes are parallel to each other. As and when their electric fields become coplanar, they will start to interact. In the case shown in Figure 1, the electric fields of atoms M_1 and M_2 are dissimilar, and the distance between them is more than the zilch-effort distance. The interactive effort produced by these electric fields is of apparent repulsion, as shown by arrows, e, in dashed lines, and acts against the gravitational attraction between the atoms to slow down the atoms' approach towards each other. Atoms will come to settle at a distance from each other, where gravitational attraction is fully

neutralized by part of the repulsion due to the electric fields. In this state, electric fields from the electronic envelopes of both atoms may interact with any other coplanar external electric fields.

Due to departures between the points of application of gravitational attractions and resultant of interactive efforts (due to electric fields), parts of repulsive efforts between the atoms may be considered to act

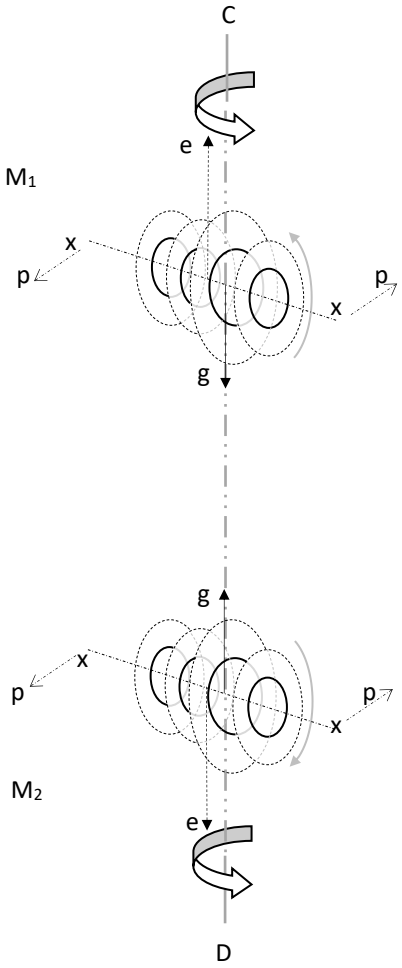

Figure 1

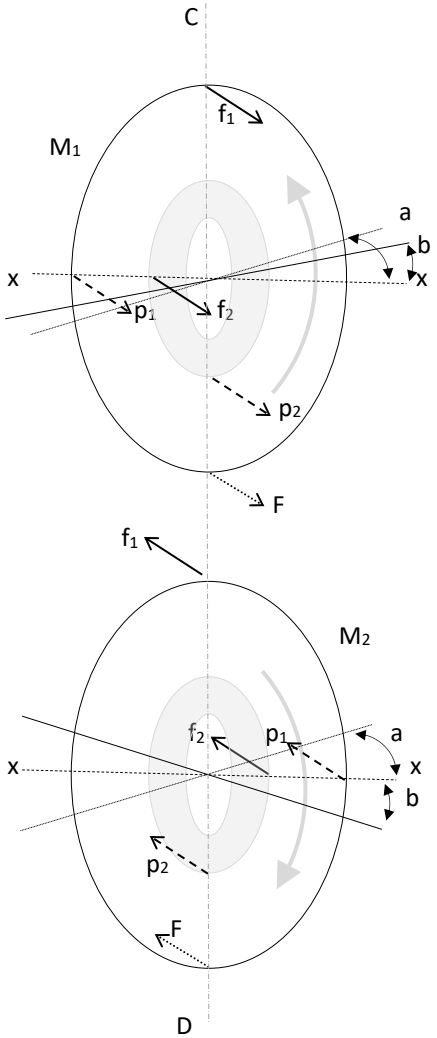

Figure 2

through the centre of gravity to oppose gravitational attractions and remaining parts through points on nuclear axes away from the atoms' centres of gravity. The parts of repulsion that act away from centres of gravity invoke gyroscopic precession, p, on both atoms to turn them about a common axis, CD, perpendicular to and passing through both nuclear axes. As the atoms approach each other, they will start to rotate in unison about the axis, CD, in the direction shown by curved block arrows (anti-clockwise looking from C to D).

Details of the rotary action of the combination of atoms are shown in Figure 2. Larger ellipses represent electronic envelopes of atoms M_1 and M_2. Grey elliptical areas within larger ellipses represent atomic nuclei. Parts of resultant efforts on electronic envelopes are shown by arrows f_1. Precessions on electronic envelopes are in the direction of the arrows p_1. Both electronic envelopes tend to turn (rotate) in anti-clockwise (looking from C to D) direction at angular speeds, represented by curved arrows xa, in the horizontal plane (with reference to figure 2). Stabilising efforts within the atoms compel nuclei to align with corresponding electronic envelopes by action of efforts represented by arrows f_2. Precessions on nuclei tilt nuclear axes of both atoms in opposite directions by an angle xb. Nuclear axis of atom M_1 tilts upwards, and the nuclear axis of atom M_2 tilts downwards (with reference to the horizontal plane in figure 2). Aligning efforts between the nuclei and electronic envelopes, acting as reactions on the electronic envelopes, are represented by arrows F. The system will reach equilibrium when the reactive efforts F equal the precession efforts that rotate the atomic envelopes. The final states of the atoms in the molecule are that both atoms are rotating in a horizontal plane at a constant angular speed, and their nuclear axes are tilted away from each other at equal angles from their stable (parallel to each other)

condition. Inherent spin motions of atoms (in vertical planes, as in Figure 2) or individual resultant fields of the atoms with respect to each other are not affected. However, due to the rotary motions of the atoms, the effectiveness of their external resultant distortion-fields is inhibited. As a result, the molecule becomes inert with respect to all external fields, while the resultant fields of constituent atoms remain fully effective within this combination, which is called a molecule.

Chemical actions are interactions between the external distortion-fields about the participating atoms or molecules. The external distortion-field about a molecule is the resultant of the distortion-fields of all its constituent atoms. A molecule is stable when its external resultant distortion-field cannot interact with external distortion-fields about other atoms or molecules. As major parts of external distortion-fields of atoms and molecules are electric in nature, they can interact only in the planes of their existence. Rotation of an electric field in a plane perpendicular to the plane of its existence reduces and inhibits its ability to interact with external distortion-fields about other atoms or molecules. Hence, the ability of an atom or a molecule to enter into chemical action depends on its rotary speed in planes across the atomic axes. The higher the rotary speed, the lower is the magnitude of the external distortion-field and its ability to chemically react.

Rotation speeds of individual atoms and the combined rotation speed of the molecule are determined by the magnitude of the torque available to rotate the electronic envelopes of atoms. The torque produced depends on the arrangements of nucleons in the atomic nuclei (distance between the centre of gravity and point of application of electromagnetic repulsion) and the relative magnitudes of gravitational attraction and electromagnetic repulsion between constituent atoms. Changes in the parameters of atoms (like variations in 3D matter-content level, nature of the surrounding universal medium, etc.) can also affect the stability of molecules. The relative positions of the atoms in the molecules formed by more than two atoms or by atoms of different kinds may be slightly different from those explained above. Larger molecules may have multiple stages of spin and rotary motions.

Reduction in the 3D matter-content level of a stable molecule (by heating or by applying higher external pressure) alters gravitational attraction between its constituent atoms. Reduced gravitational attraction enables the repulsion due to electromagnetic interactions to move the constituent atoms of the molecule farther. Increased distances between atoms reduce the magnitude of repulsions between the atoms. Proportionate reductions in the magnitudes of gravitational attraction and electromagnetic repulsion in certain kinds of molecules may permit them to maintain their stable states, irrespective of a reduction in the 3D matter-content level. However, disproportionate reductions in gravitational attraction and electromagnetic repulsion between the atoms change their (combined) rotation speeds in the plane across nuclear axes. Lowered rotation speeds of the atoms reduce their external distortion-fields partially. The magnitudes of external distortion- ields, exhibited by the atoms, are determined by a reduction in their rotation speeds. Strengthened external distortion-fields are now able to interact with the distortion-fields of other atoms or molecules in the vicinity. If these atoms are complementary to each other, the original molecule may break up, and the liberated atoms may enter into new unions with the complementary atoms or molecules to form new types of molecules and/or to release the atoms free from their molecular state.

When a stable molecule is in the vicinity of another atom or molecule, their external distortion-fields interact, and they are gravitationally attracted towards each other. External efforts by these actions may interfere with the stability of the molecule. As the gravitational attraction between a stable molecule and an external atom or molecule acts through the centre of gravity of individual atoms in the molecule, precession caused by it on the molecule may be minimal. However, the magnitudes and the point of actions (on the atomic axes) of electromagnetic repulsion between the atoms may differ from one kind of atom to another. Variations in the parameters of electromagnetic repulsion change the angular speeds of molecular rotation and the magnitudes of the effective external distortion-fields of the molecule.

Atoms in larger molecules settle at suitable distances, relative to the directions and at angular rotary speeds required to inhibit each other's external resultant fields. The ability of atoms to form molecules depends on the overall magnitude of their external resultant distortion-field about them and the distance between the centers of gravity and centers of action of field-efforts. Those atoms, in which these two centers coincide, are not able to form molecules with any other atom of their own kind or of different kinds. The severity of molecular formation or dissolution (chemical action) corresponds to distances between the centers of gravity and centers of action of external resultant distortion-fields on nuclear/atomic axes of the participating atoms. Only those

atoms whose external distortion-fields are compatible and can accommodate each other in suitable relative alignments can form molecules. Upon dissolution of molecules, constituent atoms may go free, or they may form different types of molecules.

Conclusion:

Most types of atoms have external resultant distortion-fields about them. They form molecules through electromagnetic interactions until the external resultant distortion-field about the group becomes neutral. Atoms in a molecule rotate in the planes of their atomic axes at angular speeds required to inhibit each other's resultant distortion-fields. Intensity of a chemical action by an atom is determined by the distance between its centre of gravity and centre of action by the external resultant distortion-field about the atom. Ability and efficiency of chemical actions between atoms can be varied by changing their 3D matter-content levels (by heating/cooling), by changing external pressure, by the presence of catalysts in the vicinity, or by any other method that influences their external resultant distortion-fields.

Reference:

[1] Nainan K. Varghese, *MATTER (Re-examined)*, http://www.matterdoc.in/

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