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The Magnehydrogen in Hadronic Chemistry¹

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Abstract. In this paper we have described in brief one of the great achievements accomplished by the Italian-American scientist Ruggero Maria Santilli [1], namely the isochemical model and magnehydrogen that form the subject matter of the hadronic Chemistry. This new chemical species of magnehydrogen consist of individual hydrogen atom bonded together and form stable clusters under a new internal attractive forces originating from the toroidal polarization of orbitals of atomic electrons when placed in strong magnetic fields. These magneclules are used as pollution free fuel and for other applications because there is no cracking involved while using the stored magnetic energy.

Keywords: Magnehydrogen, magneclules and hadronic Chemistry.

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INTRODUCTION

In the late seventeenth century, Issac Newton discovered classical mechanics, the laws of motion of macroscopic objects. In the early twentieth century, physicists found that classical mechanics does not correctly describe the behavior of very small particles. Such particles are described by a set of laws called *quantum mechanics* [2,3]. *Quantum mechanics* is the science of motion of micro (atomic and subatomic) particles. Its study is of great importance in chemistry because physicochemical properties of atoms and molecules, their structures, spectral behavior and even reactions may be interpreted in terms of the motion of micro particles like electron and protons [2,3]. Despite undeniable achievements, quantum chemical models of molecular structures have the following fundamental insufficiencies [4]:

1. Lack of a sufficiently strong binding force: as it is well known, the average of all coulomb forces among the atoms constituting a molecule is identically null at the semi classical level, thus resulting in the absence of any attractive force at all. Quantum mechanics cannot characterize an attractive force among neutral atoms of a Hydrogen molecule.
2. Quantum mechanics cannot explain why the Hydrogen and water molecules admit only two H-atoms and not three or more.
3. Quantum Chemistry has been unable to achieve an exact representation of molecular binding energies and other molecular characteristics via un-adulterated axiomatic principles. Electric and magnetic dipole and multi-pole moments of Hydrogen and other molecules have not been represented accurately by quantum Chemistry.
4. More accurate representation of binding energies violates basic quantum axioms and physical laws. A number of attempts have been conducted, which do indeed achieve a more accurate representation of binding energies, although such representation is reached via a number of mathematical schemes, such as the so-called *Gaussian screening of the Coulomb potentials*. These schemes imply a necessary violation of quantum axioms and physical laws.
5. Quantum Chemistry cannot provide a meaningful representation of thermodynamic properties. The missing 2% in the representation of binding energies is misleadingly small, because it corresponds to about 1,000 Kcal/mole while an ordinary thermo-dynamical reaction implies an average of 20 Kcal/mole. No scientific calculation can be conducted when the error factor of the order of 50.
6. Computer usages in quantum chemical calculations require excessively long period of time. This is notoriously due to the slow convergence of conventional quantum series, a feature that persists to this day despite the availability of powerful computers.

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7. Quantum Chemistry predicts that all molecules are ferromagnetic. This inconsistency of the most rigorous disciplines of this century, Quantum electrodynamics, which establishes that, under an external magnetic field, the orbits of valence electrons must be polarized in such a way to offer magnetic polarity opposite to that of the external field (polarization that generally occurs via the transition from space to toroidal distribution of the orbitals).

As it is well known, the individual atoms of a molecule preserve their individuality in the current model of chemical bonds. As a result, quantum electrodynamics predicts that the valence electrons of the individual atoms of a molecular bond must acquire polarized orbits under an external magnetic field. As a result, Quantum Chemistry predicts that the application of an external magnetic field South-North, to hydrogen H-H, water H-O-H and other molecules implies their acquisition of the net total, opposite polarity North-South, $H_{\uparrow}-H_{\uparrow}$, $H_{\uparrow}-O_{\uparrow}-H_{\uparrow}$, etc., which is in dramatic disagreement with experimental evidence.

A most important insufficiency is the inability to represent deep mutual penetrations of the wave packets of valence electrons in molecular bonds. The latter interactions are known to be:

- *Nonlinear*: - i.e., dependent on powers of the wave functions greater than one;
- *Nonlocal –integral*: - i.e., dependent on integrals over the volume of overlapping, which, as such cannot be reduced to a finite set of isolated points; and
- *Non-potential*: - i.e., consisting of contact interactions with consequential zero range for which the notion of potential energy has no mathematical or physical sense.
- *Non-Hamiltonian*: - i.e. not representable via a Hamiltonian, thus requiring additional terms and consequently
- *Non-Unitary*: - i.e. the time evolution violates unitary condition $U \times U^{\dagger} = U^{\dagger} \times U = I$.

Notice that the condition of non-unitarity is necessary otherwise one would fall back fully within the basic axioms of quantum chemistry (under the unitary representations). To overcome the above said insufficiency there evolved Hadronic Chemistry. The Italian-American scientist Ruggero Maria Santilli has achieved a milestone in formulating a new mathematics (hereon referred to as Santilli's Mathematics) that streamlined various branches of physics including quantum mechanics. To remove these fallacies Santilli has formulated new mathematics and hadronic mechanics. Hadronic mechanics is characterized by novel *iso*-, *geno*- and *hyper* mathematics for the representation of reversible, irreversible and multi valued system respectively with Hamiltonian and non-Hamiltonian effects [1]. Accordingly, the hadronic mechanics has three corresponding branches, *isomechanics*, *genomechanics* and *hyper mechanics* and their *isoduals*. Hadronic chemistry is applicable at distances of about 1 fm (10^{-13} cm) or less. As it is well known that, all fundamental particles with finite mass have wave packets of the order of 1 fm hence the process of molecular binding is a case of interior interactions of these wave packets [5-8].

Most of the environmental pollution is caused by fossil fuel is due to chunks (dimers) of un-combusted fuel that may be carcinogenic primarily because consisting of incomplete combustion of fuel. Therefore, Santilli has proposed and synthesized a new chemical species called as *magnecules* under strong magnetic field [5]. Santilli's magnecules are in gaseous, liquid and solid states consist of stable clusters composed of conventional molecule or dimers with individual atoms bonded together by opposing magnetic polarities of toroidal polarization of the orbit of at least the peripheral atomic electrons when exposed to sufficiently strong external magnetic fields, as well as the polarization of the intrinsic magnetic moment of nuclei and electrons [1,4-8]. A population of *magnecules* constitutes a chemical species when essentially pure i.e. when molecules or other species are contained in very small percentages in a directly identifiable form.

In this paper we discuss *magnehydrogen* in hadronic chemistry. This new chemical species of *magnehydrogen* consist of individual hydrogen atom bonded together and form stable clusters under a new internal attractive forces originating from the toroidal polarization of orbital's of atomic electrons when placed in strong magnetic fields. These magnecules are used as pollution free fuel and for other applications because there is no cracking involved while using the stored magnetic energy.

ISOCHEMICAL MODEL

Santilli and Shillady [7] developed an isochemical model of valence bond considering deep overlapping of the wave packets of the bond forming valence electrons and obviously the interactions at 1 fm level of considerations requiring having the property nonlocal, non-linear, non-potential, non-Hamiltonion and hence non-unitary transformations. The deep overlapped singlet state of electrons is termed by Santilli as *isoelectronium* because the energetic description of it requires his *isomathematics* [3-5]. Its pictorial representation for hydrogen molecule is depicted in Figure 1 below. This branch is known as hadronic chemistry [4].

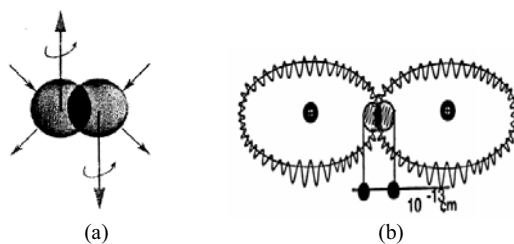


FIGURE 1. (a) Isoelectronium composed of two valence electrons in singlet coupling and (b) oo-shaped orbit of isoelectronium in hydrogen molecule and dimensions of isoelectronium.

The main features of the isochemical model are:

1. Exact representation of molecular binding energies from first axiomatic principles without ad hoc adulteration.
2. An explanation for why Hydrogen molecule have only two Hydrogen atoms.
3. Reconstruction of the superposition principle at the isotopic level, thus permitting an axiomatically consistent study of composite systems under non-linear, non-local and non-Hamiltonian interactions. This is achieved by embedding of all non-linear terms in the isotopic element.
4. Reduction of computer time by at least 1000-fold. This is permitted by the fact that the absolute value of the isounit used to compute isoelectronium energy is much bigger than one and, consequently, the isotopic element is much smaller than one, this then turns all slow convergent series into a strong (fast) convergent form [6-8].

This model as shown in Figure 1 represents motion of isoelectronium in an oo-shaped orbit and this fact lucidly help in describing the magnequar bonding discussed in next section.

MAGNEHYDROGEN

The new species is generically denoted MH and its individual clusters are denoted MH_n , $n = 2, 3, 4, \dots$ to specify the number of hydrogen atoms per cluster. Most of the environmental pollution is caused by fossil fuel is due to chunks (dimers) of uncombusted fuel that may be carcinogenic primarily because consisting of incomplete combustion of fuel. Therefore, Santilli has proposed and synthesized a new chemical species called as magnequar under strong magnetic field [1,4,5,9]. Santilli's magnequar are in gaseous, liquid and solid states consist of stable clusters composed of conventional molecule or dimers with individuals atoms bonded together by opposing magnetic polarities of toroidal polarization of the orbit of at least the peripheral atomic electrons when exposed to sufficiently strong external magnetic fields, as well as the polarization of the intrinsic magnetic moment of nucleia and electrons [1,4,5,9]. A population of magnequar constitutes a chemical species when essentially pure i.e. when molecules or other species are contained in very small percentages in a directly identifiable form. To our best understanding, the most plausible interpretation of the new species of MH is that originally presented by Santilli in Ref. [9], namely, a multiple of the specific weight under a high Hydrogen percentage is evidence of a new clustering of H-atoms which cannot possibly be of valence type due to the evident absence of the valence electrons necessary for a quantitative representation of the clustering of many different atoms. Therefore, Santilli presented the new species of MH as additional evidence on the existence of the new species of magnequar for Santilli's original presentations and Ref. [9] for recent experimental confirmations as well as to update the rapidly growing literature in the field). In essence, the new chemical species of magnequar can be defined as clusters of individual atoms (H, O, C, etc.), dimers (HO, CH, etc.) and ordinary molecules (H_2 , CO, H_2O , etc.) bonded together by attractive forces between opposing magnetic polarities of toroidal polarizations of atomic orbitals, as well as the polarization of the magnetic moments of nuclei and electrons (see a conceptual rendering of MH_n in Figure 2). Santilli first developed, the so-called PlasmaArcFlowTM Reactor, that converts various liquids into a combustible gaseous fuel known as MagneGas (MG). The gasification is achieved via a submerged DC electric arc between carbon electrodes that, under sufficient powers (of the order of 300 kW or more) is capable of producing at atomic distances the high values of the magnetic field necessary for the polarization of electron orbitals into toroids (estimated as being of the order of 10^{12} Gauss).

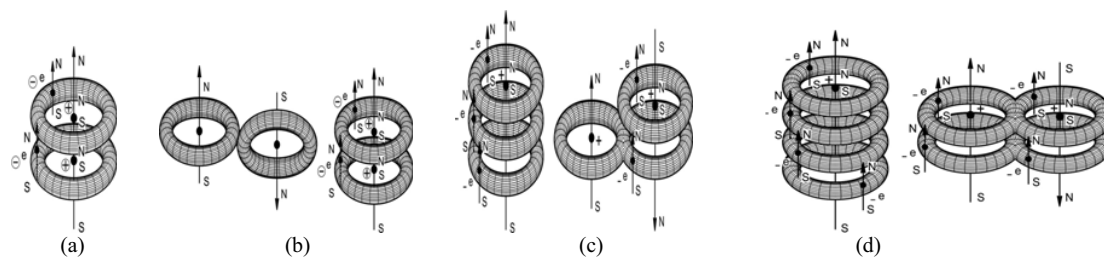


Figure 2: Conceptual rendering of Santilli's magnequles. (a) Magnehydrogen (MH), two hydrogen atoms forming a magnequle $MH_2(H \times H)$, (b) A cluster MH_2 in MH composed of H-H and $H \times H$ molecules, (c) A cluster MH_3 in MH composed of the magnequle species H-H \times H and H \times H \times H, (d) A cluster of MH_4 in MH composed of the magnequle species H \times H \times H \times H and H-H \times H-H (not shown species is H-H \times H \times H).

ENERGETICS OF MAGNECULES

The calculation of these polarized magnetic moments at absolute zero degree temperature is elementary [10]. By using rationalized units, the magnetic moment $M_{e-orb.}$ of a polarized orbit of one atomic electron is given by the general quantum mechanical law:

$$M_{e-orb.} = (q/2m)L\mu, \quad (1)$$

where L is the angular momentum, μ is the rationalized unit of magnetic moment of the electron, $q = -e$ and $m = m_e$. Now on following steps described by Santilli [11] we obtain,

$$M_{e-orb.} = M_{isoelectronic-orb.} = 1,856.959\mu, \quad (M_{e-orb.} / M_{p-intr.}) = 1,856.959/1.4107 = 1,316.33 \quad (2)$$

where we have used magnetic moment of proton equal to 1.4107μ . Thus it shows that the magnetic moment created by the orbiting in a plane of the electron in the hydrogen atom is 1,316 times bigger than the intrinsic magnetic moment of the nucleus, thus being sufficiently strong to create a bond. Say at 10 Tesla of magnetic field the magnequle bond has a strength of about 20-25 kcal/mol [12].

CONCLUSIONS

In preceding sections, we have described in brief the physical and mathematical background of Santilli's covering of quantum chemistry known as hadronic chemistry. The aspects those covered in brief herein are the isochemical model of valence bond formation, basics of magnequle interactions, some aspects of magnehydrogen and its energetic. The magnequles are pollution free fuels because it provides stored magnetic energy without molecular cracking.

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