

## EXPERIMENTAL CONFIRMATIONS OF HYDROGEN ACCRETION AND ITS EXPECTED NOVEL APPLICATIONS

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### Abstract

In this paper, we present experimental confirmations, obtained at three different analytic laboratories via the use of three different gas chromatographers, of the new feature known as *Hydrogen accretion*, and consisting in the capability by an individual Hydrogen atom under suitable polarization of its orbital to bond itself to generic molecules from 2 to large *a.m.u.*; we focus the attention in the representative values of 3, 4, 5, 6, 19, 29, and 45 *a.m.u.*; we tentatively interpret these species as being due to magnecular bonds of one or more Hydrogen atoms with conventional molecules; we point out expected implications for the structure of liquids; we indicate industrial applications for new types of Hydrogen rich fossil fuels; and we offer to qualified colleagues at no cost sample of the anomalous gas exhibiting Hydrogen accretion for independent verifications.

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### 1. Introduction

In preceding works (see Ref. [1] of 2005 with preceding literature quoted therein, and Refs. [2,3] with updated literature), the author presented physical and chemical evidence suggesting the possible existence of a new chemical species consisting of *clusters of individual atoms* (*H, O, C, etc.*), *dimers* (*HO, CH, etc.*) and *ordinary molecules* (*H<sub>2</sub>, H<sub>2</sub>O, CO, 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 Fig. 1 for a conceptual rendering).

The new chemical species was submitted by the author under the name of *magnecules* in order to differentiate them from the conventional *molecules*, where the latter are referred to clusters of atoms solely under one or another conventional valence bond, while the former are referred to mixtures of molecular and magnecular bonds. Valence bonds are generally represented with the symbol “–,” while magnecular bonds are represented with the symbol “×.”

Among the various anomalous characteristics of magnecular bonds, the author tentatively identified in preceding works [1] a new feature under the name of *Hydrogen accretion*, consisting of the anomalous bond of one or more Hydrogen atoms to a conventional molecule

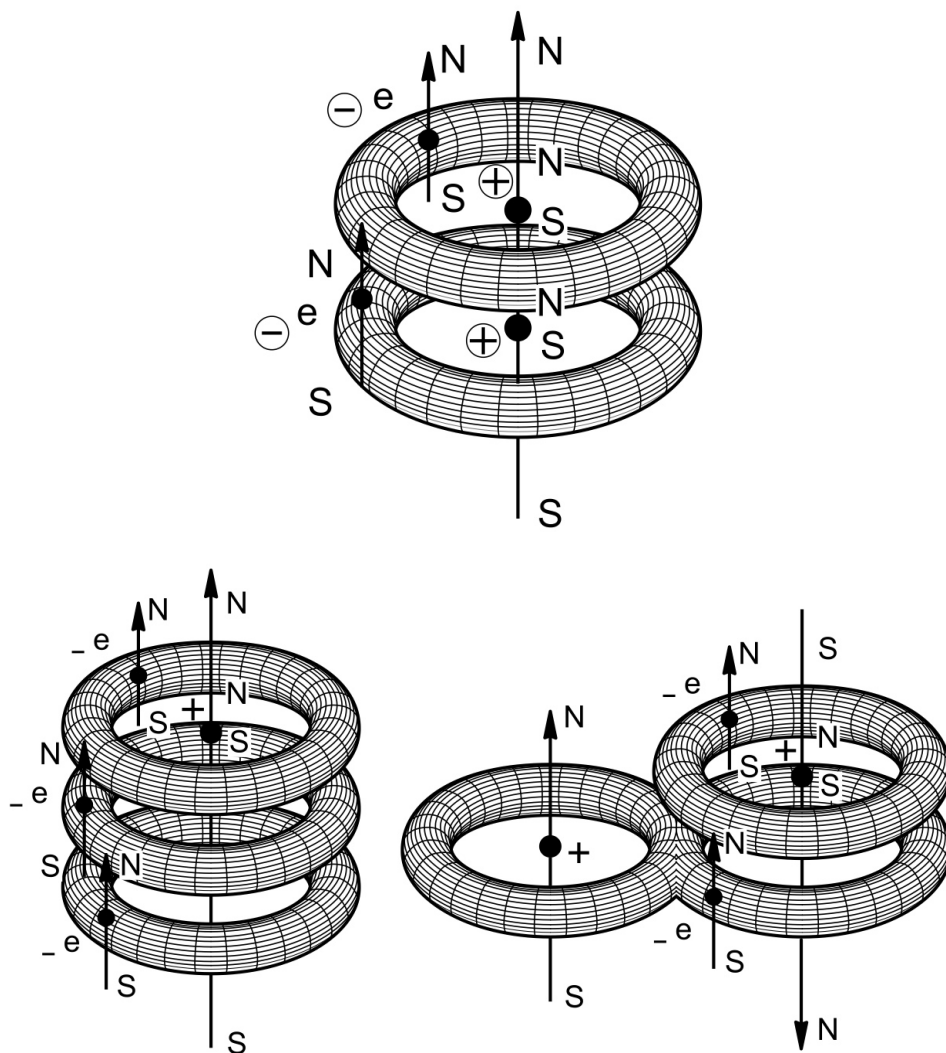


Figure 1: *At the top, we show a conceptual rendering of a “two-body magnecule” at absolute zero degree temperature illustrating the dominance of the attraction due to magnetic polarizations of electron orbitals, as well as that of electrons and nuclei over repulsion forces due to opposing charges, since the atoms herein considered are assumed to have a null total charge. At the bottom, we show a conceptual rendering of the two possible configurations of a “three-body magnecule.”*

as well as to generic clusters from 2 *a.m.u.* all the way to large *a.m.u.* We should indicate, for readers not familiar with the new Hydrogen technology here referred to, that Hydrogen accretion is definitely *impossible* for conventional Hydrogen atoms (those with a spherical distribution of their orbitals) and it is solely possible for Hydrogen atoms exposed to very large magnetic fields, such as those of the order of  $10^{12}$  Gauss) available at atomic distances from DC electric arcs, necessary to create the toroidal polarizations illustrated in Fig. 1. In this paper, we present three independent experimental verifications of Hydrogen accretion obtained at three different analytic laboratories by using three different chromatographic equipment; we focus the attention in the representative values of 3, 4, 5, 6, 19, 29, and 45 *a.m.u.*; we tentatively interpret these species as being due to magnecular bonds of one or more Hydrogen atoms with conventional molecules; we point out expected implications for the structure of liquids; we indicate industrial applications for new types of Hydrogen rich fossil fuels; and we offer to qualified colleagues at no cost sample of the anomalous gas exhibiting Hydrogen accretion for independent verifications.

## 2. Experimental Confirmations of Hydrogen Accretion

The first independent experimental confirmation of Hydrogen accretion was obtained on November 2, 2009, at the FAI Analytic Laboratories in Atlanta, Georgia, via a GC-MS operated at  $10^0$  C column temperature, with the detection of anomalous species consisting of the increase of one value of *a.m.u.* from 2 to large values of *a.m.u.*. These anomalous species were detected in a combustible gas produced and sold under the commercial name of MagneGas<sup>TM</sup> that is known to have a magnecular structure due to its origination via a submerged DC electric arc (see [www.magnegas.com](http://www.magnegas.com) and Refs. [1,2,3]).

Among a large number of scans, we show in the top of Fig. 2 a representative scan in the range 200 to 250 *a.m.u.* characterized by individual increases of 1 *a.m.u.* without solution of continuity, i.e.,

$$200, 201, 202, 203, 204, 205, \dots, 250 \quad (1)$$

Following the above 2009 measurements, the author searched for years for another laboratory to perform independent verification or denial of said anomalous species. Unfortunately, no laboratory cooperated with the author's rather unusual requests in the use of a GC-MS necessary for the detection of magnecules [1-3]. For instance, analysts would insist in using the GC-MS according to procedures fully established for the detection of molecular species (e.g., by using high column temperatures, short elution times, etc.). Practically unsormontable difficulties were encountered with recent gas chromatographic equipment using capillary feeding lines because of the general decline by analysts that the very feature to be detected, Hydrogen accretion, would clog up capillary feeding lines, thus preventing the gas sample to even enter the instrument. These and other difficulties explain the lapse of time between the preliminary identification of Hydrogen accretion and the date of this note.

Finally, in early 2010 the author became aware of the intention by HyFuels Corporation in Tarpon Springs, Florida, to have an older GC-MS/IRD restored by a specialized company in the field, and elected to wait for the availability of that instrument due to its superior capability of detecting magnecules (see Refs. [1,2,3] for brevity).

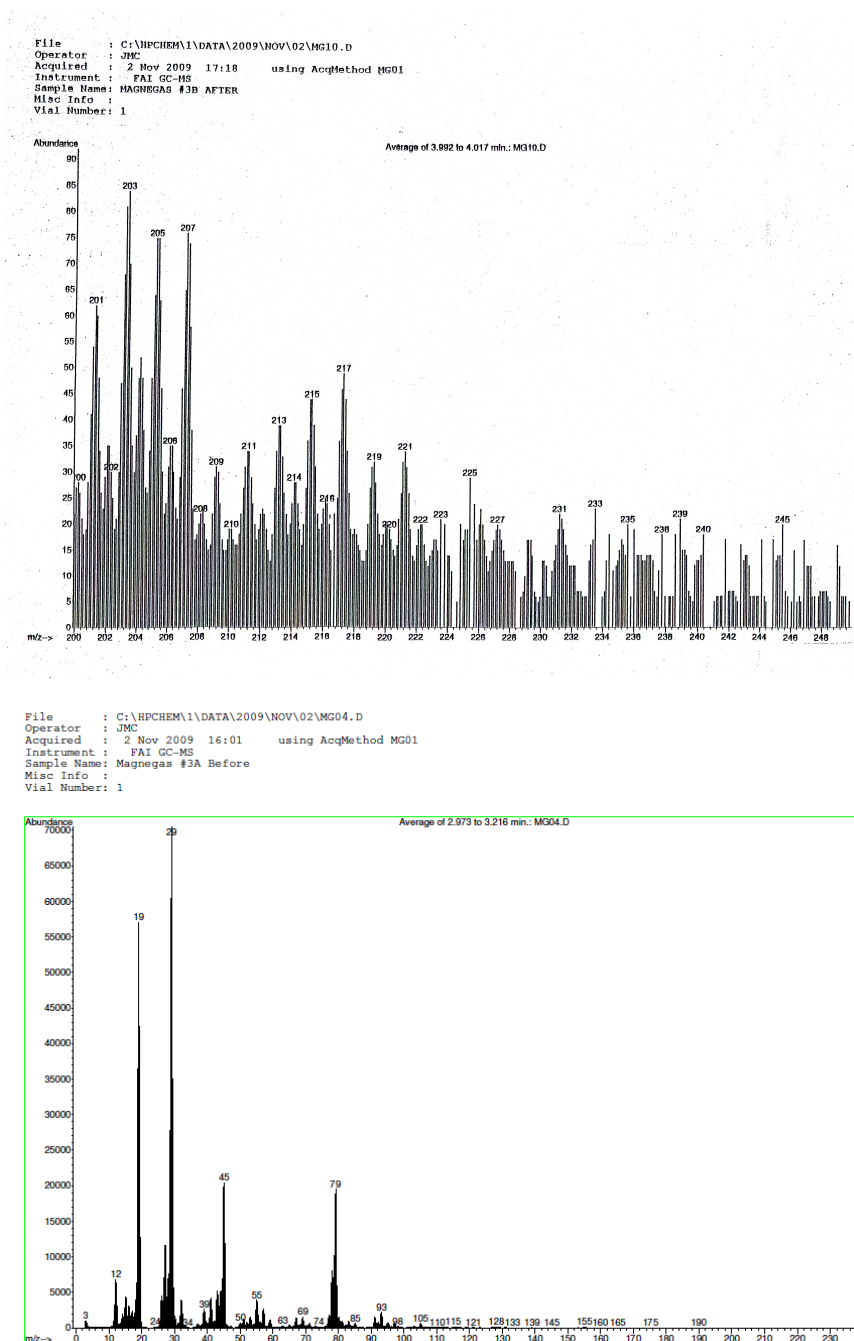


Figure 2: The top view shows a representative scan obtained on November 2, 2009, by the FAI Analytic Laboratories of Atlanta, Georgia, on the gaseous fuel MagneGas via a contemporary GC-MS operated at low column temperature, providing experimental evidence of Hydrogen accretion from 2 to hundreds of a.m.u. (see the top view for a representative scan from 200 to 250 a.m.u.. The lower view shows representative example of Hydrogen accretion with the anomalous species with 19, 29, 45 and other a.m.u..

The desired GC-MS/IRD eventually became operational in early 2012 by comprising a HP GC model 5890, a HP MS model 5972, and a HP IRD model 5965 equipped with a HP Ultra 2 column 25 *m* long, 0.32 *mm* ID, and film thickness of 0.52 *um*, with temperatures starting at 10<sup>0</sup>*C* for 4 min, then incrementally raised to 250<sup>0</sup> *C* at 10<sup>0</sup>*C/min*.

When properly operated for the detection of magnecules (e.g., by using the lowest available column temperature, the longest available elution time, the largest available cryogenically cooled feeding line, etc.), the latter instrument did confirm the magnecular structure of MagneGas [1] as consisting of clusters fully identified in the GC-MS, but possessing no IR signature at the *a.m.u.* of the clusters (and not at the *a.m.u.* of the constituents), as shown in representative scans of Fig. 3.

In Figs. 3 and 4, we present the second experimental evidence obtained on October 9, 2012, via the above identified GC-MS/IRD confirming the existence in the MS spectrum of the anomalous species with magnecular bonds as well as species expected to be due to Hydrogen accretion.

The third experimental confirmation was obtained on November 15, 2012, at the Oneida Research Services (ORS) in Whitesboro, NY, via an IVA 110s with an accuracy of  $\pm 5\%$  at 5000 *ppmv* (see also Ref. [2] for details). As one can see from Fig. 5, the IVA 110s provided an accurate confirmation of the Hydrogen accretion to hundreds of *a.m.u.* (only values up to 75 *a.m.u.* are shown in Fig. 5 for brevity), including the confirmation of anomalous species with 3, 4, 5, 6, 19, 29 and 45 *a.m.u.*

By recalling that MagneGas has no appreciable content of Helium, we tentatively present the following interpretation of representative new species with 3, 4, 19, 29 and 45 *a.m.u.* for all possible magnecular interpretations (see also Figs. 1 and 6)

$$H_3 = \{H_2 \times H, H \times H \times H \times H\}, \quad (1a)$$

$$H_4 = \{H_2 \times H_2, H_2 \times H \times H, H \times H \times H \times H \times H\}, \quad (1b)$$

$$H_3O = \{H - O - H \times H, H - (O \times H) - H\}, \quad (1c)$$

$$COH = \{C - O \times H, O - C \times H\}, \quad (1d)$$

$$CO_2H = \{C - O_2 \times H, O_2 - C \times H\}, \quad (1e)$$

with similar interpretations holding for additional anomalous species as identified, e.g., in Fig. 5.

The above magnecular interpretation is based on a number of aspects, such as:

1) The progressive Hydrogen accretion up to large *a.m.u.* in a gas synthesized by carbon and a liquid feedstock, such as MagneGas, whose heaviest molecule should be  $CO_2$ ;

2) Known difficulties in the molecular interpretation of  $H_3$ , such as the impossibility according to quantum mechanics of bonding a third valence electron to a pair of valence electrons in singlet coupling (because the former electron has spin 1/2 while the latter electron pair has spin zero); the impossibility under a three valence electron bond of an exact representation of the binding energy of the  $H_2$  constituent (due to the impossibility for the three valence electrons to have a continuous bond at all times); expected consequential impossibility to verify the principle of conservation of the energy at the time of the synthesis of

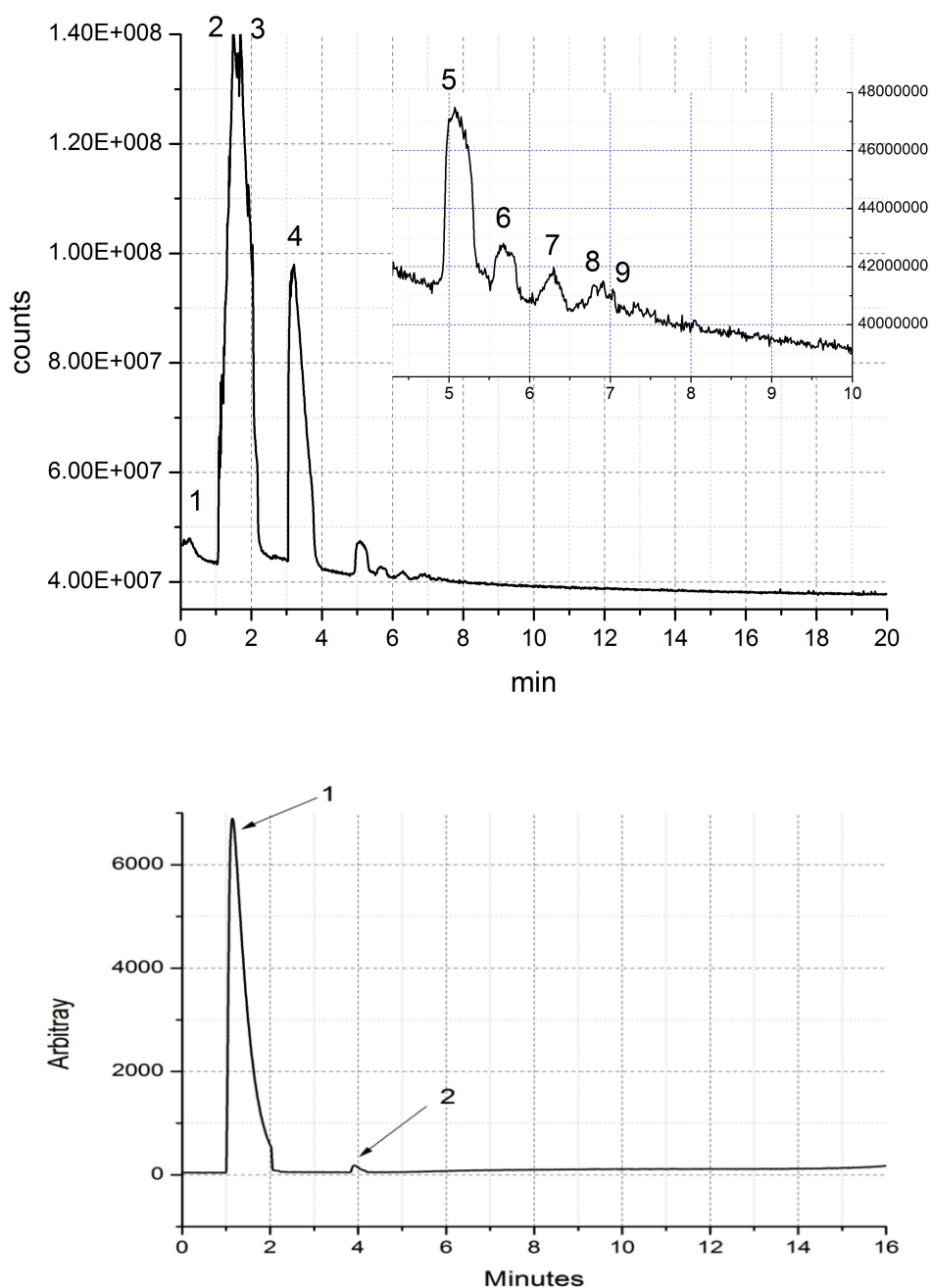


Figure 3: Representative scans achieved on October 9, 2012, via the GC-MS/IRD described in the test on MagneGas fuel. The top view presents a GC-MS scan from 2 a.m.u. to 500 a.m.u. with the column operated at  $10^0$  C and the use of 22 minutes elution time. The bottom view presents the IRD scan of the same gas and the same injection used for the top view, that shows the existence of species well identified in the GC-MS that have no IR signature at their a.m.u., thus confirming the magneclular structure of the gas presented in Ref. [1].

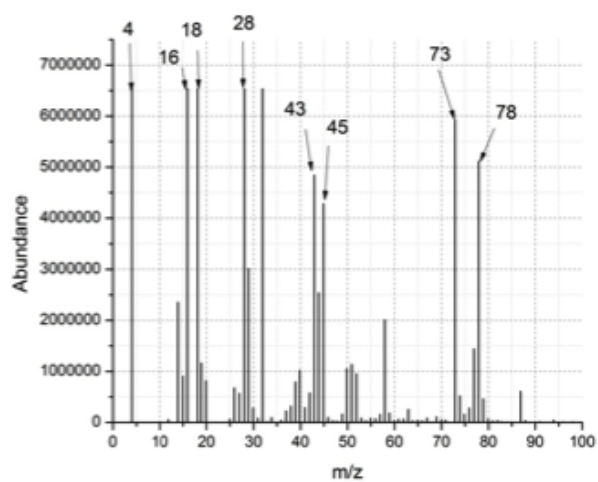
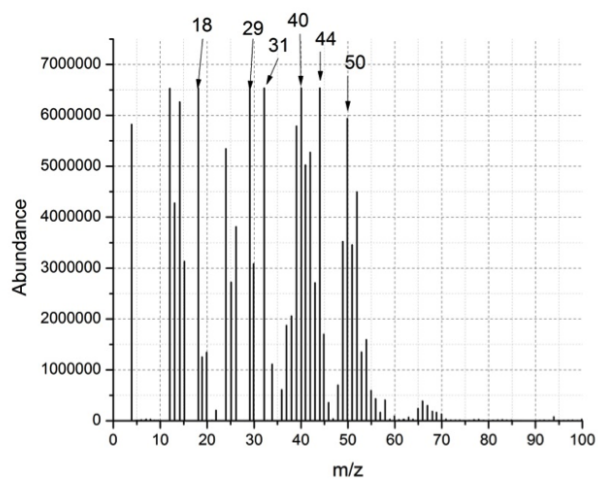
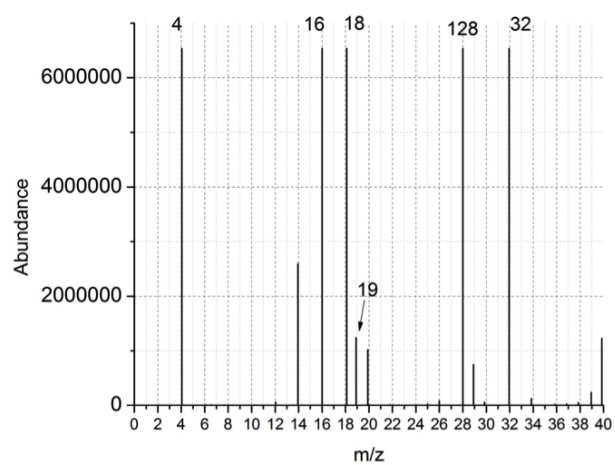


Figure 4: *Representative MS scans of the magneclular clusters of Fig. 3 confirming the existence of anomalous species expected to be due to Hydrogen accretion.*

ORS REPORT NO.	196809-001		
DATE TESTED	9/5/2012		
QUANTITY TESTED	2		
PACKAGE TYPE	standard		
SAMPLE	ID	E Q09012	E Q02171
Mass	2	177,131	150,391
Mass	3	93,300	77,390
Mass	4	354,930	397,630
Mass	5	373	242
Mass	6	20,779	16,402
Mass	12	1,208	753
Mass	13	73	70
Mass	14	4,517	3,051
Mass	15	641	518
Mass	16	4,393	2,411
Mass	17	9,362	3,121
Mass	18	39,386	12,362
Mass	19	5,922	2,123
Mass	20	17,950	4,954
Mass	22	178	0
Mass	24	239	0
Mass	26	1,043	236
Mass	27	466	320
Mass	28	43,690	28,234
Mass	29	1,186	881
Mass	30	1,305	382
Mass	31	228	0
Mass	32	7,328	5,828
Mass	40	469	337
Mass	42	137	0
Mass	43	459	456
Mass	44	11,546	8,718
Mass	45	399	375
Mass	46	137	0
Mass	73	320	336

Figure 5: *The scan at ORS laboratories of MagneGas via IVA 110s providing the third independent confirmation of the existence of anomalous species (1) plus the identification of numerous others not considered in this note for simplicity.*



$H_3$  as occurring in the species herein considered, from  $H_2$  and  $H$ ; and other insufficiencies that eventually multiply for  $H_4$ ,  $H_5$ ,  $H_6$ , etc.

3) The elimination of the Hydrogen accretion and of all related anomalous species when the gas is tested with a GC-TCD operated at high temperature (see Ref. [2] for details), thus confirming that species (1) have a characteristic Curie temperature at which magnetic bonds disappear, and the reduction of the gas to about 65%  $H_2$ , 30%  $CO$  plus small percentages of  $H_2O$  and  $CO_2$ , thus confirming that species (1) are indeed characterized by Hydrogen accretion of  $H_2$ ,  $H_2O$ ,  $CO$  and  $CO_2$ .

### 3. Expected Applications of Hydrogen Accretion

We would like to close this paper with a few comments. First, it is significant for the new Hydrogen era to indicate the possible connection between Hydrogen accretion and the liquid state of water as well as of fuels such as gasoline, diesel, etc. because a deeper understanding of the latter is evidently essential for the conception and development of environmentally more acceptable fuels.

As it is well known, the liquid state is widely interpreted as being due to the bond of Hydrogen atoms belonging to different water molecules (also called “H-bridges”). It is then suggestive to assume for species (1c) the conceptual rendering of Fig. 6 since it may either represent directly said H-bonds, or provide a significant contribution for their deeper quantitative representation.

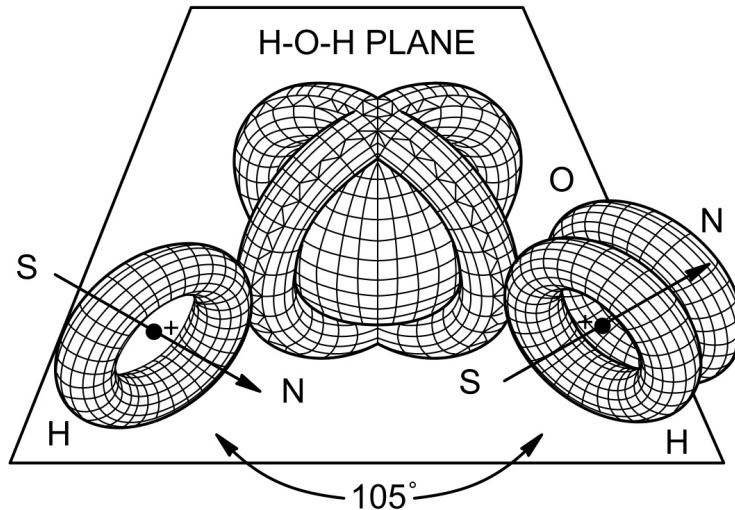


Figure 6: A conceptual rendering of anomalous species (1a) as a possible quantitative model of the H-bonds in the liquid state of water. Note that the water molecule is represented as it occurs in nature, namely, with polarization of the orbitals perpendicular to the  $H - O - H$  plane, thus possessing a molecular structure particularly suited for the magnetic bond  $H \times H$ .

In fact, the current understanding of the liquid state of water, even though correct and valuable, is still phenomenological to a considered extent since it misses an explicitly identified

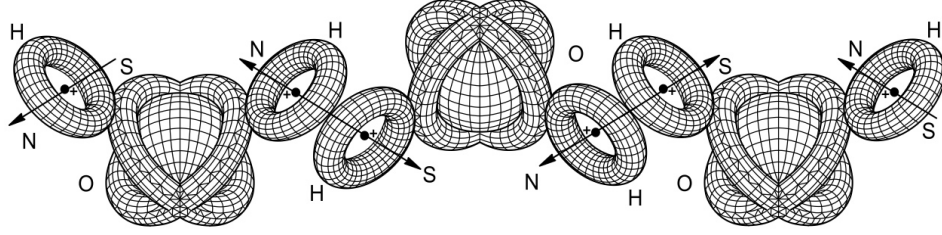


Figure 7: *One of the possible magnecular bonds of H-atoms in the liquid state of water according to Ref. [1]. The second expected magnecular H-bond as in Eq. (1a) is that with the O-atom, resulting in the typical lattice structure of the liquid state.*

attractive force responsible for the H-bridges. By comparison, the attractive force in the magnecular bond is known theoretically and experimentally [1].

Therefore, we provide in Fig. 7 a conceptual rendering of one of the magnecular H-bonds of the liquid state of water as  $H - O - H \times H - O - H$  with corresponding bonds to the left and to the Oxygen not depicted in Fig. 7 for brevity. In particular, it was assumed in Ref. [1] that the water boiling temperature is the Curie temperature of magnecular bonds in the liquid state of water.

It is evident that, in the event confirmed, similar magnecular interpretations of liquid fuels, such as gasoline, diesel, etc. may allow new industrial applications of the Hydrogen accretion particularly significant from an environmental viewpoint. One such application, under full development at the industrial level, but still mostly unknown in academia, is the synthesis of new liquid fuels under the names of Hy-Gasoline<sup>TM</sup>, HyDiesel<sup>TM</sup>, etc. (patented and international patents pending) essentially composed by ordinary gasoline and diesel, subjected to Hydrogen accretion [1].

In fact, Hydrogen is known to be a fuel with one of the highest flame temperatures and speed. Therefore, when Hydrogen is added to conventional fossil fuels, their Hydrogen component caused the combustion of contaminants in the exhaust, such as  $CO$  and  $HC$  in a measure proportional to the Hydrogen percentage. The importance of the industrial realization of the fuels HyGasoline, HyDiesel, etc. is that the Hydrogen component is contained in a *bonded* form which is stable at ambient temperature, rather than that of a mixture. Yet the bond is sufficiently *weaker* than the valence bond as a central condition to allow full combustion.

As indicated earlier, the gaseous fuel MagneGas is commercially produced and sold in various countries. Therefore, samples of MagneGas can be made available at no cost to qualified chemists, provided we receive assurances for the use of the same equipment and the same procedures as those described in this note and in Refs. [1,2,3].

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