SAE TECHNICAL PAPER SERIES

SAE 1999-01-3325
JSAE 9938080

Explanation of Anomalous Combustion of Brown's Gas Using Dr. Mills' Hydrino Theory

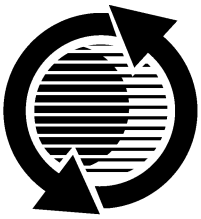
Hiroshi Ymamoto
Yamaha Motor Co., Ltd.

Reprinted From: Proceedings of the 1999 SAE Small Engine Technology Conference (P-348)

SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL

Small Engine Technology Conference and Exposition
Madison, Wisconsin
September 28-30, 1999

400 Commonwealth Drive, Warrendale, PA 15096-0001 U.S.A. Tel: (724) 776-4841 Fax: (724) 776-5760



ISSN 0148-7191

Printed in USA

SAE 1999-01-3325 / JSAE 9938080

Explanation of Anomalous Combustion of Brown's Gas Using Dr. Mills' Hydrino Theory

Hiroshi Ymamoto
Yamaha Motor Co., Ltd.

ABSTRACT

There are several anomalous combustion phenomena that cannot be explained by current theories. One of them is the stoichiometric mixture of hydrogen and oxygen, known as Brown's gas. Dr. Randell Mills developed "hydrino" theory starting in 1986 that can explain excess heat in the absence of nuclear products in the research of cold fusion. It was applied to explain this anomalous combustion, by replacing potassium ion with atomic oxygen. It was found out that hydrino theory can explain this anomalous combustion phenomenon including abnormal heat generation from combustion of emulsified fuels. It was suggested that this technology can be utilized for the improvement of future internal combustion engines.

INTRODUCTION

The thermal efficiency of internal combustion engines has been improved quite a bit, but it needs to be improved further to be competitive with the rapid progress of fuel cell technology. Recently, the gasoline direct injection is deemed as a next generation of internal combustion engines and beyond that, the active radical combustion is being studied, but without further innovative combustion technology, it would be very difficult for internal combustion engines to be competitive with fuel cells. The combustion process is rather complicated and even in case of combustion process of pure hydrogen, there remains a lot of area for further investigation. There are also a couple of strange combustion phenomena which seem to violate the law of conservation of energy.

10 years have passed since the announcement of cold fusion. It is perceived by most people that cold fusion is a fake, but not few scientists have been pursuing this phenomenon and it is expected this technology will become available for practical usage in the near future. The research of cold fusion brought out a couple of a very interesting theories which are expected to be able to explain anomalous combustion phenomena which current conventional theory fails to do.

EXAMPLE OF ANOMALOUS COMBUSTION

BROWN'S GAS – Brown's gas is a mixture of mono-atomic hydrogen and oxygen, not di-atomic[(1)].

Brown's gas is said to be made by electrolysis of water with alternating current, not direct current which is normally used. It is claimed that Brown's gas has peculiar characteristics such as,

- implosive, not explosive,
- does not boil water but can melt such a high heat resistance material as tungsten.

EMULSIFIED FUELS – Dr. O.A.Uyehara, et al.[(2)] presented a technical paper which claims that the mixture of ionized water (52%) and fuel oil (48%) can be burned without air and its thermal efficiency is 2.3 times greater than the air/fuel system for the same combustor-heat transfer layout. They stated the actual mechanism of this combustion is still not clear.

COLD EXPLOSION OF WATER BY AN ELECTRIC ARC – Dr. P. Graneau[(3)] reports that when high electric voltage stored in a capacitor is applied to a thin filament of water, a cold explosion of water takes place but its kinetic energy is far beyond the input energy. He attributes this to the liberation of molecular bonding energy of water.

SONOLUMINESCENCE – Sonoluminescence is the phenomenon of light emission by sound-driven gas bubbles in fluids. Ultra-sound make bubbles collapse and expand accompanied by a flash of light shorter than 10 pico second. The emitted spectrum of the light suggests the temperature at the center of bubbles reach tens of thousand Kelvin. So far no theory to explain this phenomenon has been established.

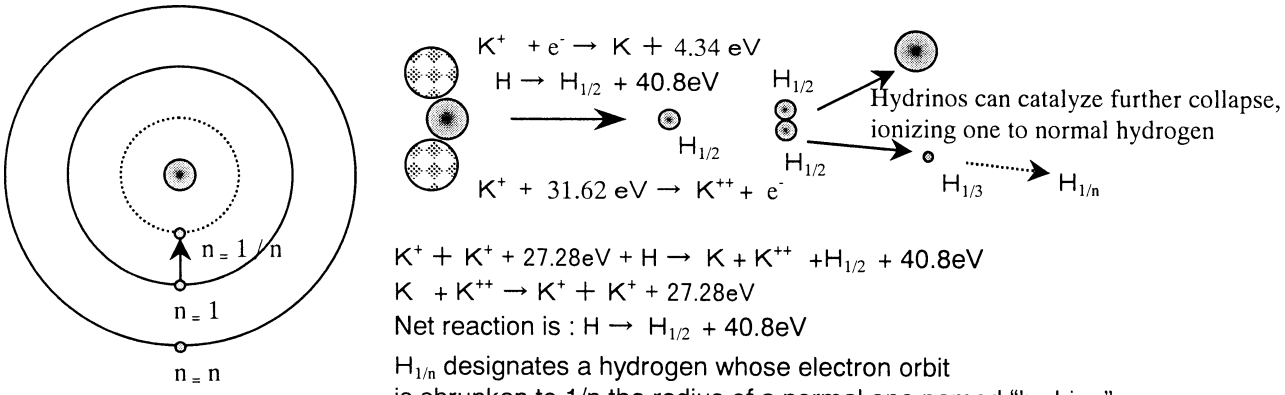


Figure 1. Mechanism of "hydrino" generation and energy release

DR. MILLS' HYDRINO THEORY

There are several scientists who claim that a electron with lower energy states than the ground electronic state are possible in the hydrogen atom. According Dr. Randell Mills[4], one of these scientists, it is postulated that hydrogen atoms can achieve these lower states by a resonant collision with a nearby atom or combination of atoms having the capability to absorb the energy to effect the transition. The potassium ions are identified as having a transition energy level that matches with the potential energy of the electron of hydrogen atom with the ground state (27.2eV) needed to effect a transition from the generally accepted ground state associated with quantum number n=1 to a lower energy state with n= 1/2, and to other lower fractional states. As shown in Fig.1, changes in ionization state of two potassium ions result in the net difference of 27.28 eV which can absorb the potential energy of a hydrogen atom, making the hydrogen atom shrink to the fractional state of n= 1/2 with release of a net energy of 40.8eV.

Dr. Mills named this shrunken hydrogen atom "hydrino" and he claims that this hydrino can be a catalyst to shrink other hydrinos to further lower states, increasing the energy release per atom by the process, resulting in the energy release of the level of 1000 eV / atom in total which is about 1000 times more energy than conventional chemical reaction. Based on this theory, Dr. Mills developed a water based electrolyte cell using a potassium carbonate electrolyte and succeeded in generating anomalous heat. Then he started a new approach using hydrogen gas and potassium ion in gas phase and he claims he succeeded in generating anomalous heat as stated before.

ATOMIC OXYGEN CATALYST THEORY

The author postulated that 2 atomic oxygens can play the same function as potassium ion because the ionization energy of oxygen is 13.61eV and 2 atomic oxygen's ionization energy is 27.22eV which is very close to the potential energy of the electron of hydrogen 27.20eV.

Shown below is its calculation.

$$H + {}_2O + 27.22eV \rightarrow H_{1/2} + 2O^+ + 2e^- + 40.8eV$$
$$2O^+ + 2e^- \rightarrow 2O + 27.22eV \quad (1)$$

Net reaction is : $H \rightarrow H_{1/2} + 40.8eV$

This reaction can bring out anomalous energy.

In this reaction, a simultaneous collision of one hydrogen atom and two oxygen atoms, so called multi-body reaction is required in which probabilities of collision is rather small. It is well expected that the following reaction can also take place, but this has to be confirmed by experiment.

$$H + O + 27.22eV \rightarrow H_{1/2} + O^{++} + 2\,e^- + 40.8eV$$
$$O^{++} + 2\,e^- \rightarrow O + 27.22eV \quad (2)$$

Net reaction is : $H \rightarrow H_{1/2} + 40.8eV$

EXPLANATION OF COMBUSTION OF BROWN'S GAS BY HYDRINO THEORY

The combustion process of hydrogen and oxygen is explained by the following process.

$H_2 \rightarrow H + H$
$O + H_2O \rightarrow OH + HO$
$H + O_2 \rightarrow O + OH$
$O + H_2 \rightarrow H + OH$
$O + H_2O \rightarrow OH + OH$
$OH + H \rightarrow H_2O$

In this process, OH radicals play the key role.

When the temperature is raised to the level where OH radicals are dissociated to atomic oxygen and hydrogen, or in case of Brown's gas in which its components are just atomic oxygen and hydrogen, then the following reaction can be greatly expected.

$H + {}_2O + 27.22eV \rightarrow H_{1/2} + 2O^+ + 2\,e^- + 40.8eV$
$H + O + 27.22eV \rightarrow H_{1/2} + O^{++} + 2e^- + 40.8eV$

Fig. 2 illustrates the combustion mechanism of hydrogen and oxygen in both cases.

According to Dr. Mills' theory, H1/2 and further shrunken "hydrinos" can be a catalyst for the next step resulting in the higher energy release per step. Even the lowest energy release of 40.eV is ultra-violet range and these light emissions wouldn't be absorbed by water, but can be changed to heat energy when they strike metals. That is the reason why the flame of Brown's gas can not boil water but melt metals.

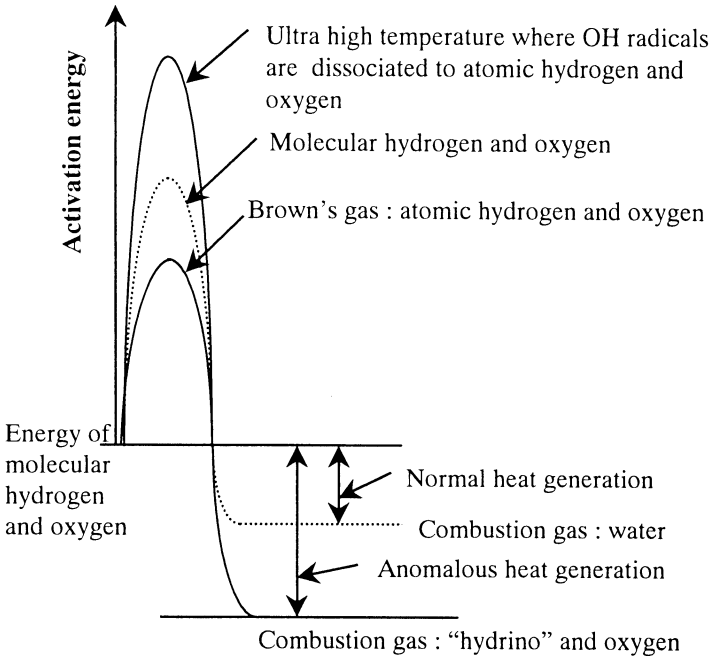


Figure 2. Combustion mechanism of "hydrino"

EXPLANATION OF AIR-LESS COMBUSTION OF EMULSIFIED FUELS

The following chemical reaction is well known as steam reforming process and has been widely used in petroleum refinaries.

$$C_nnH_m + nH_2O \rightarrow nCO+(n+m/2)H_2$$

Carbon monoxide can be converted to carbon dioxide and hydrogen by the water shift reaction as is shown below.

$$nCO + nH_2O \rightarrow nCO + nH$$

If the hydrogen thus generated can be burned by catalytic process as explained above without consuming oxygen, Dr. Uyehara's claim "Fuel Oil Combustion with Water Only" can be justified. In order to have this combustion, it is prerequisite to have a very hot condition, preferably over 2000 K so that the thermal dissociation of oxygen and hydrogen can take place. In his experiment, preheating procedure by combustion of oil and air was done. In case of the combustion using air as oxidant, there are 4 times more nitrogen than oxygen and the probability of collision between oxygen and nitrogen increases, resulting in the formation of NOx whose reaction is endothermic and absorbs a quite big thermal energy of 182.4 kJ/mol. It is quite logical to shut off air when the furnace gets to the temperature high enough for this anomalous combustion stage.

EXPLANATION OF COLD EXPLOSION OF WATER AND SONOLUMINESCENCE

In both cases, it can be easily imagined the temperature of water can reach over 4000 K where majority of water is dissociated to atomic oxygen and hydrogen. If the reaction expressed in the formula [1],[2], takes place in the recombining stage, there would be an anomalous energy generation. In order to verify this hypothesis, a spectrum analysis of sonoluminescence and its cross check with Dr. Mill's predicted frequency is highly recommended.

FUTURE APPLICATION OF ANOMALOUS COMBUSTION PHENOMENA

So far these anomalous combustion phenomena have not been studied by the main stream of the researchers of internal combustion engines, primarily because there was no theory to explain them. Once someone were to present a technical paper like this, he would be labeled as a peculiar person and he will lose his credibility in the society of engineering. But now, thanks to the scientists in the field of cold fusion, we, engineers of internal combustion engines can utilize the derivatives of cold fusion technology.

Internal combustion engines are being challenged by fuel cell technology. If the engineers of internal combustion engines are courageous enough as Dr. Uyehara to take on anomalous combustion and try hard to utilize it, the internal combustion engines can survive for another decade.

SUMMARY

1. Dr. Mills established a theory that there can be a lower orbit of electron of hydrogen below the ground state and developed a catalytic process using potassium ion to generate heat energy from hydrogen 1000 times more than conventional combustion process.
2. Based upon his theory, new idea to use atomic oxygen as catalyst was proposed.
3. This new idea successfully explained several anomalous combustion phenomena.
4. It was proposed to study these anomalous combustion phenomena and utilize them for internal combustion engines to compete with fuel cells in the thermal efficiency race.

REFERENCE

1. Wiseman, G., Brown's Gas Book 1, Eagle Research Publications 1995.
2. Uyehara,O.et al., Fuel Oil Combustion with Water Only for NOx Suppression and Improved Energy Recovery. Diesel Engine Emission Reduction Workshop at the University of California-San Diego 1995.
3. Graneau,P., Gaining Solar Energy from Ordinary Water. Proceedings of World Renewable Energy Congress June 1996 Denver Colorado USA.
4. Mills,R. The Grand Unified Theory of Classical Quantum Mechanics, Blacklight Power Inc., 1999.