

WATER POWER

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ABSTRACT: In this paper is analyzed the possibility of using water as a future fuel which may replace hydrocarbons. Research directions for this domain are presented in the following.

KEY WORDS: water, hydrocarbons, energy.

1.INTRODUCTION

Lately were analyzed within the institutions subordinated to the U.S. State Department, a series of catastrophic type scenarios that range from a concrete reality based on strict measurements Geophysical and geological: the volume of existing pollutants in the atmosphere from hydrocarbon combustion and industrial processes - which appeared due to the greenhouse effect - was not that big of a few hundred million years. Is already registered a heating of atmosphere by more than 0.3 degrees per year, which seems very much.

This scenario takes place in the following way:

- Atmospheric warming leads to warming seas and oceans;
- Hot water accelerates melting ice caps, resulting in additional sea-level;
- Melting ice caps leading to decrease their surface, thus reducing areas as identified in sunlight, with the consequent acceleration of warming waters, and thus increase their level.

2.SCENARIOS

In this scenario takes place on two parallel planes:

A: The sharp rise in the water level of seas and oceans would lead to flooding of coastal areas with the consequence of migration on resident populations to areas with higher elevation. Appear here social, economic, geopolitical implications hard to guess.

B: The sharp rise in the water level of seas and oceans would lead to flooding of the Gulf Stream, Gulf Stream, which warms the climate in the northern hemisphere, to the latitude of New York.

Neutralization of the Gulf Stream would lead to a cold climate in the northern hemisphere, so the England to be a temperate continental climate with Siberian winter events. It is estimated that this type of catastrophic scenario regarding a possible evolution of the earth's climate could be avoided if emissions decrease by about 60 % which, in the current context of increasing industrialization and vehicular traffic, it seems almost impossible.

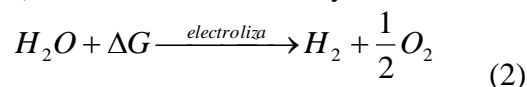
In the context of the need to reduce atmospheric pollutants, it is worth the possibility of using water, energy involved in the structure.

This paper aims to assess this possibility, as well as highlighting some potential research directions.

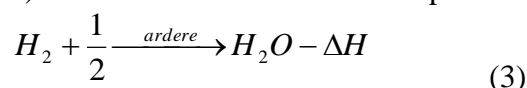
In this regard, it will look to start the electrolysis reaction of water (I) to assess its potential energy relative to that of conventional hydrocarbons (II).

The separate analysis of the two reactions involved issues arising from the first part of the theoretical arguments in favor of continuing efforts towards considering water as fuel future inexhaustible, clean, alternative fuels classics.

a) reaction of the electrolysis of water:



b) recombination of the reaction products:



The two reactions are related to 1 mole of water, corresponding to 18 g.

We noted:

ΔG - Potential changes in Gibbs free energy with the meaning (any type of energy) here due to which electricity is produced by electrolysis reaction of water;

ΔH - Change in enthalpy, meaning the amount of heat that is formed from the combustion of hydrogen, called the free enthalpy of formation (water in this case).

Relations (2) and (3) will be analyzed separately.

a). the reaction of electrolysis of water:

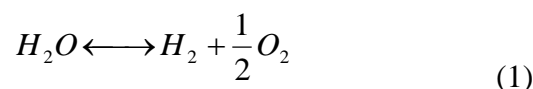
2 Faraday of electricity, so $Q = 193038$ Coulomb break one mole of water, so 18g in H_2 and O_2 components.

In direct current, a water electrolysis cell is operational if there is a difference between the electrode potential more than 1.7 V.

With these data, we consider for simplicity:

- Current passing through the electrolysis cell for one second:

(I) reaction of the electrolysis of water and then the recombination of the reaction products can be written in the general form of reverse reaction:



$$I = \frac{Q}{t} = 193038 \frac{C}{s} \quad (4)$$

- The power required by the cell for electrolysis:

$$P = UI = 1,7V \cdot 193038 \frac{C}{s} = 328,1646 \frac{kJ}{s} = \Delta G \quad (5)$$

3.CONCLUSION

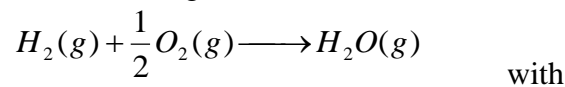
Conclusion (a) one mole of water for electrolysis is necessary quantity of electricity:

$$\Delta G = W_{el.} = 328,1646kJ$$

b). recombination reaction products (burning hydrogen and oxygen)

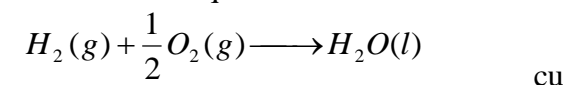
From chemistry textbooks were taken the relations:

- Reaction of gaseous water:



$$\Delta H_{(g)} = -241,6 \frac{kJ}{mol} \quad (6)$$

- Reaction of liquid water:



$$\Delta H_{(l)} = -285,49 \frac{kJ}{mol} \quad (7)$$

in which:

(g) - gas;

(l) - liquid;

ΔH - Free enthalpy of formation;

- numerical values are measured under the conditions $p = 1 \text{ atm}$ and $T = 25$ degrees Celsius;

We consider the existence of an overall efficiency of reversible reaction (1) as:

$$\eta_{(g)} = \frac{241,6}{328,1646} = 0,736 \quad (1)$$

$$\eta_{(l)} = \frac{285,49}{328,1646} = 0,87$$

But,
 $(1 - 0,736) + 1 = 1,264$
 $(1 - 0,87) + 1 = 1,13$

CONCLUSION (b) the cost of the energy produced by burning H₂ and O₂ in stoichiometric proportions resulting from the reaction of electrolysis is 1.13 to 1,264 times higher than the price of electricity used for electrolysis.

(II) The energetic potential of hydrocarbons:

Calorific values, so the amount of heat released by burning 1 kg of hydrocarbon is given below [1]:

Gasoline: 11,500 kcal / kg = 40.070 kJ / kg

Diesel: 10,600 kcal / kg = 44 308 kJ / kg

oil: 9,000 kcal / kg = 37 620 kJ / kg

Oil: 9,550 kcal / kg = 39 919 kJ / kg

In which case we can consider an average value:

$$Q_{ardere} = 40.000 \text{ kJ/kg}$$

Because water was referred to 1 mol H₂O 18 g water so you have to determine the heat generated by the combustion reaction products released during electrolysis of water 1kg:

$$241,5 \text{ kJ} \dots\dots\dots 18 \cdot 10^{-3} \text{ kg H}_2\text{O}$$

$$Q_{inferior} \dots\dots\dots 1 \text{ kg H}_2\text{O}$$

$$Q_{inferior} = 13.416,6 \text{ kJ/kg}$$

$$285,49 \text{ kJ} \dots\dots\dots 18 \cdot 10^{-3} \text{ kg H}_2\text{O}$$

$$Q_{superior} \dots\dots\dots 1 \text{ kg H}_2\text{O}$$

$$Q_{superior} = 15860 \text{ kJ/kg}$$

Considered as a representative value:

$$Q_{average} = 14,000 \text{ kJ / kg}$$

For more than three times less than the heat transferred by the combustion of one kg. Fuel classic. At the same time, to carry out electrolysis of an kg. water:

$$18\text{g H}_2\text{O} \dots\dots\dots 328.1646 \text{ kw}$$

$$1 \text{ kg H}_2\text{O} \dots\dots\dots X$$

$$X = \frac{328,1646}{18 \cdot 10^{-3}} = 18231,3 \text{ kw} = 18231,3 \frac{\text{kJ}}{\text{s}}$$

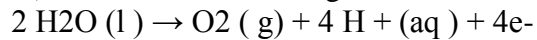
$$= 18231,3 \frac{\text{kJ}}{3600\text{s}} \cong 5 \text{ kwh}$$

CONCLUSION (II): The water electrolysis consumes 5 kWh electricity for heat gets out aproximatv 14000 kJ. At about the same price of 1 kg of fuel is obtained so about three times less energy.

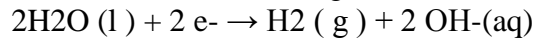
This means that the single electrolysis carried out at conventional conditions, the current is inefficient in the use of thermal energy, but as a result of the determination is off in a different direction and research study: increase the efficiency of the electrolysis process, such that combustion oxygen-hydrogen mixture to become economically viable compared to burning hydrocarbons article belonging to Greg Watson[2]:

„There are two electrochemical reactions Taking place in the conventional electrolysis cell:

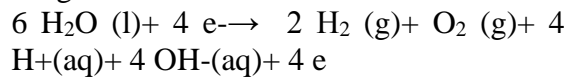
1) Oxidation is occurring at the anode



2) Reduction is occurring at the cathode

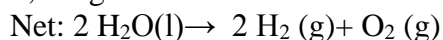


To keep the numbers of electrons balanced, the cathode reaction must take place, twice as much as the anode reaction. If the cathode reactionis multiplied by 2 and the two reactions are added together we get:



Note the 4 H⁺ (aq) and the 4 OH⁻ (aq) which remain in the water. If we allow enough timeafter the removal of

power (both electrodes) the H^+ and OH^- combine in the water to form H_2O and cancel species that appear on both sides of the arrow, we get the overall net reaction:



So during the application of power we get the creation of both $H_2(g)$ and $O_2(g)$ bubbling up as well as $H^+(aq)$ and $OH^-(aq)$ in the water. As the number of + and - ions in the water are balanced and there is no change in the Redox of the water.

However if we just disconnect the positive lead from the power supply, we stop the $OH^-(aq)$ from donating an electron via the anode. BUT the electron rich negative cathode lead is still attached, causing the $H^+(aq)$ to be electrostatically attracted to the cathode, gladly accepting an electron and thus forming $H(aq)$ which then combines with another $H(aq)$ to form $H_2(g)$ which then happily bubbles to the surface. Note this electron comes from the negative connection to the power supply. No positive connection is needed for this to happen. This electron rich source can be electrostatic in nature.

As this process is reducing the number of $H^+(aq)$ charges in the water, the Redox of the water shifts negative due to the unreacted $OH^-(aq)$ in the water which has no electron poor (+) place to donate the excess electrons to. This $OH^-(aq)$ also supports improved electrical conductivity during subsequent positive power pulses to the anode and increases the amount of seeding $H^+(aq)$ and $OH^-(aq)$ in the water. The ideal power “On” pulse length and applied voltage remain to be determined.

It would appear that to generate a Redox negative state (much more $OH^-(aq)$ than $H^+(aq)$) requires the application of pulsed DC to the cell with much longer “Off” period than “On” periods. If too long a delay occurs between the “On” pulses the $H^+(aq)$ and $OH^-(aq)$ in the water may naturally recombine to form

H_2O . If too short a delay then insufficient time is allowed to attract $H^+(aq)$ ions to the cathode, accept an electron and form $H_2(g)$.

So during the DC pulse “On” period we get the generation of $H^+(aq)$ and $OH^-(aq)$ and during the “Off” period we get $2 H^+(aq) + 2 e^- \rightarrow H_2(g)$ with the solution being forced to Redox negative due to the unaffected $OH^-(aq)$.

While this reaction is not OU, it does suggest the electron source applied to the cathode during the power off cycle may be from a negative electron rich electrostatic charge and thus it may be possible to generate Hydrogen from atmospheric electrostatic charges instead of using conventional power”.

REFERENCES

1. Internet, „calorific values of hydrocarbons”;
2. Internet, Electrostatically Assisted Hydrogen Electrolysis (Greg Watson 15 May 2006).