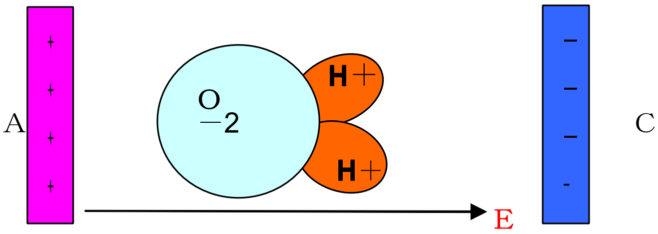
Water Electrolysis by Charge Density Wave could Create Energy(version2) 2013/1/8^21

The 1st version is rather not clear,while v2 would be more concrete to be visilbe.　A simple, but physically based analysis would establish pragmatical desing figures. You could get concrete image of CDW(charge density wave in water). However,note you should not expect to gain big output power in amateure enviroments.

[１]：The Summary on CDW Water Splitting Mechanism.

⑴Reality of electric dipole in water are (+)hydrogen ion(proton) and (-)oxygen ion(electron).



⑵**CDW can be radiated from anode without enegy input but dielctric loss one.**

http://www.777true.net/BWG.pdf

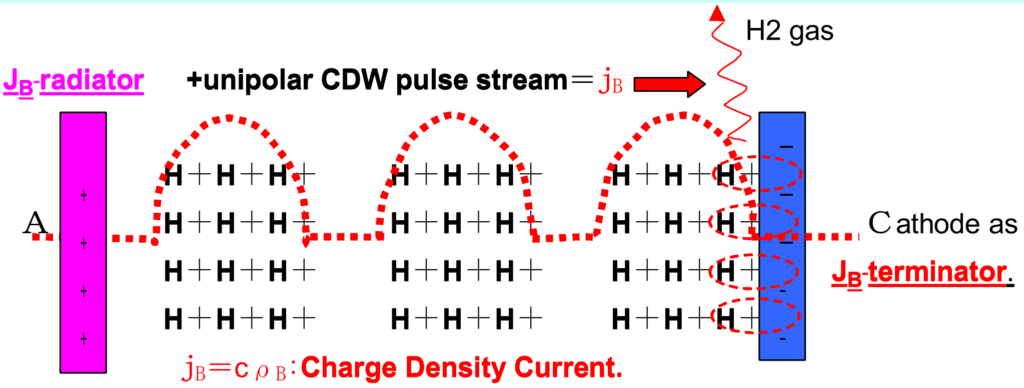
⑶Especially a CDW could penetrate all the material without loss,but except charge termination space(electrode or reciever antenna of impedance matching with ground).

＊This proof require Quantum-Electro-Dynamics.Summary to tell,it is due to generalized 4dimensional **current conservation low(CCL)**which never be broken down.

(**CCL**)　$0=\partial_\mu(j_\mu+j^B{}_\mu)\Leftrightarrow \Box B=(ic)^{-1}\partial_\mu j_\mu$. (wave equation of B=CDW).

＊j_μ is real current, $j^B{}_\mu$ is dielectric one. However in pragmatical view point,wave scattering in propagation by inhomogeneous medium(tensor permitivity such as water of random orienting polarized molecular)become equivalent to wave intensity attenuation.

⑷Then (+)CDW j_B in water is **protons(H＋) stream flux**,which could be only terminated by electron coupling at cathode,which is nothing but **H2 gas generation**.



$j_B=c\rho_B$:**Charge Density Current.**

$c=1/\sqrt{(\varepsilon\mu)}$ CDW propagation velocity,　ρ_B=Charge Density.

(5)H2 gas molecule generation rate N_G/sec at "unit area of cathode".

N_G＝2H＋ion transfer rate＝**CDW current density**/2xelectron charge＝$j_B/2e$.

<<gas generating rate formula>>

Example-1)H2 of 1_litter/100sec＝(1/100x22.4)mol/s＝$6x10^{23}/2240$＝N_G(H2).

$j_B=2e\times N_G(H2)=2x1.6X10^{-19}C/s\times 6x10^{23}/2240=86A/1m^2$. . .Note this value!!!

H2 burning energy＝120 MJ/kg＝240KJ/mol(molecular mass=2g,gas=22.4 l)

http://hypertextbook.com/facts/2005/MichelleFung.shtml

1lit/100sec＝240KJ/m×(1m/22.4)/100s＝107W(output power). . . Note this value!!!

Example-2,see p3) $j_B=(\varepsilon_r)^{3/2}\varepsilon_0(2\pi f)^2/c_0)(\pi/2)V|\sin(\omega t-kx)|$.<$\varepsilon_r$(H20)＝82?>

V f	1M	10M	100M	316MHz	1G
10V	0.0087	0.87	86.5A /107W	865A /1070W	8650/10700W
100V	0.087	8.7	865A /1070W		

☞:These are entirely ideal value without actual loss consideration(especially on ε_r>.

(6)negatgive ion(O_{-2}) transfer to anode by long range dipole tunneling

DC electrolysis is to drive DC current as H+ ion stream,of which charge is terminated by electron capturing at anode with generating H2 gas,while O2 gas is generated at anode by **long range dipole tunneling.**

HO- generated at anode is **qusi-transfer** toward anode from **cathode the reaction space**.

⊕{$H_2O-H_2O-H_2O-H_2O-H_2O-H_2O$}⊖ is original dipole chain by DC bias.

$H^+ + HO^- - H_2O-H_2O-H_2O-H_2O-H_2O$: Water Splitting reaction at cathode.

(Ⅰ)$HOH-HO^- - H_2O-H_2O-H_2O-H_2O$: **dipole chain tunneling** of HO^-.

(Ⅱ)$OH_2-OH_2-HO^- - H_2O-H_2O-H_2O$

$OH_2-OH_2-OH_2-HO^- - H_2O-H_2O$

....

(Ⅲ)$OH_2-OH_2-OH_2-OH_2-OH_2-OH^- \rightarrow 4HO^- \rightarrow 2H_2O+2O^{-2}\rightarrow 2H_2O+O_2-2e^{-1}$. 2

O_2 gas at anode.

[2] : The Fundametal Equatios as for CDW.

(1)potential propagation equation and the general solution.

$\Box\phi(t,\mathbf{x})=-\rho(t,\mathbf{x})/\varepsilon. \Leftrightarrow\ \phi(\mathbf{x},t)=\oiiint dv'\,\rho(\mathbf{x}',t-R/c)/4\pi\varepsilon R.\ \ \langle R\equiv|\mathbf{x}-\mathbf{x}'|\rangle.$

(2)Electric field intensity.

$\mathrm{E}(t,\mathbf{x})=-\mathrm{grad}\,\phi(t,\mathbf{x})\equiv$ wave term + static term

$=\oiiint dv'\,\partial_t\rho(\mathbf{x}',t-R/c)\cdot(\mathbf{x}-\mathbf{x}')/4\pi c\varepsilon R^2+\oiiint dv'\,\rho(\mathbf{x}',t-R/c)\cdot(\mathbf{x}-\mathbf{x}')/4\pi\varepsilon R^4.$

(3)Electric flux. $\mathrm{D}(t,\mathbf{x})=\varepsilon(t,\mathbf{x}))\mathrm{E}(t,\mathbf{x}).$

(4)**charge density.**

$\rho_B(t,\mathbf{x})=\mathrm{div}\,\mathbf{D}(t,\mathbf{x})=-\varepsilon\,\mathrm{div}\cdot\mathrm{grad}\,\phi(t,\mathbf{x}).$

$\Box\rho_B(t,\mathbf{x})=\mathrm{div}\cdot\mathrm{grad}\,\rho(t,\mathbf{x})$

$\rho_B(t,\mathbf{x})=\oiiint dv'\,\mathrm{div}'\cdot\mathrm{grad}'\,\rho(t-R/c,\mathbf{x}')/4\pi\varepsilon R$

$=\oiiint dv'\langle\mathrm{div}'\{\mathrm{grad}'\,\rho(t-R/c,\mathbf{x}')/4\pi\varepsilon R\}-\mathrm{grad}'\,\rho(t-R/c,\mathbf{x}').\mathrm{grad}'(1/4\pi\varepsilon R)\rangle$

$=\oiint dS'\{\mathrm{grad}'\,\rho(t-R/c,\mathbf{x}')/4\pi\varepsilon R\}+\oiiint dv'\,\mathrm{grad}'\,\rho(t-R/c,\mathbf{x}')\cdot(\mathbf{x}-\mathbf{x}')/4\pi\varepsilon R^4\rangle.$

$*\ \mathrm{B}\,\mathrm{div}\,\mathbf{A}=\mathrm{div}(\mathbf{A}\mathrm{B})-\mathbf{A}\,\mathrm{grad}\,\mathrm{B}.$

(5)**current density j_B.**

$j_B(t,\mathbf{x})=-\partial_t\mathbf{D}(t,\mathbf{x})=\varepsilon\,\partial_t\mathrm{grad}\,\phi(t,\mathbf{x})$

$=-\oiiint dv'\,\varepsilon\,\partial_t^2\rho(\mathbf{x}',t-R/c)\cdot(\mathbf{x}-\mathbf{x}')/4\pi c\varepsilon R^2-\oiiint dv'\,\varepsilon\,\partial_t\rho(\mathbf{x}',t-R/c)\cdot(\mathbf{x}-\mathbf{x}')/4\pi\varepsilon R^4.$

Example-2) $\phi(t,\mathbf{x})=(\pi/2)\mathrm{V}|\sin(\omega t-kx)|.\langle\langle k=\omega/c=\sqrt{\varepsilon_r}\,\omega/c_0\rangle\rangle.$

$j_B=\varepsilon_r\varepsilon_0\partial_t\mathrm{grad}\,\phi=(\varepsilon_r)^{3/2}\varepsilon_0(2\pi f)^2/c_0)(\pi/2)\mathrm{V}|\sin(\omega t-kx)|$

$*\ \varepsilon_r(\mathrm{H2O})=82$, or more less in DC biased, $(\varepsilon_r)^{3/2}=742.$

$*\ \varepsilon_0=8.85\mathrm{x}10^{-12}\mathrm{F/m}$, $\quad *\ c_0=3\mathrm{x}10^8\mathrm{m/s}$

$*\ (\varepsilon_r)^{3/2}\varepsilon_0(2\pi)^2/c_0=8.65\mathrm{x}10^{-16}.$

Example-2) $j_B=(\varepsilon_r)^{3/2}\varepsilon_0(2\pi f)^2/c_0)(\pi/2)\mathrm{V}|\sin(\omega t-kx)|.$

V f	1M	10M	100M	316MHz	1G
10V	0.0087	0.87	86.5A /107W	865A /1070W	8650/10700W
100V	0.087	8.7	865A /1070W		

☞:These are entirely ideal value without actual loss consideration(especially on ε_r>.

High frequency,voltage and **current** are troublesome for semiconductor devices.

It would be emergent works for semiconductor R&D engineers.

☞☞:To tell fact from **CDW-itself enegy density,** P=VI is larger than H2-gas energy !!.

For example,10v×86.5A=860W>107W. "This is rather ridiculous".

However,high frequency CDW in water is loss-propagation(due to random scattering)

to get "**net electric energy**" at reciever antenna with matching load.

[3]: "Plane Wave Solution" from Radiating Source: 2013/2/18, 19

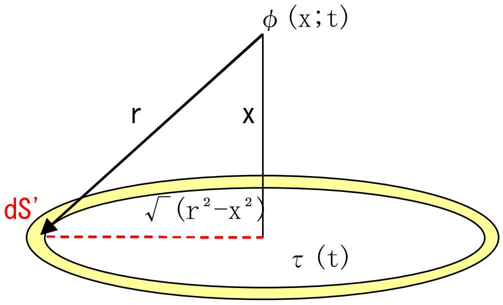
How much stimulate radiating source $=\rho$ to obtain desireable CDW intensity $=\phi$?.

Then elementary foudation may be following plane wave equation with radiating source.

(1) $\Box\phi(t,\mathbf{x}) = -\rho(t,\mathbf{x})/\varepsilon_\circ$. $\Leftrightarrow$ $\phi(\mathbf{x},t) = \oiiint dv'\,\rho(\mathbf{x}', t-r/c)/4\pi\varepsilon r$. $\langle r \equiv |\mathbf{x}-\mathbf{x}'|\rangle$.

Now let's accomplish integral.

(2)**variables assignment in radiator and observed space**.



$d(\sqrt{(r^2-x^2)})/dr = r/\sqrt{(r^2-x^2)}$

$dS = dr.\,r/\sqrt{(r^2-x^2)}\cdot 2\pi\sqrt{(r^2-x^2)} = dr.\,2\pi r.$

(a) $\tau(t) = \tau\exp(i\omega t)$. ⟨surface charge density⟩

$\phi(x;t) = \oiint dS'\,\tau(t-r/c)/4\pi\varepsilon r$

$\phi(x;t) = \oiint dS'\,\tau(t-r/c)/4\pi\varepsilon r = \oiint dr\cdot 2\pi r\cdot\tau\exp i\omega(t-r/c)/4\pi\varepsilon r$

$= (\tau/2\varepsilon)\exp(i\omega t)\int_x^\infty dr.\exp(-i\omega r/c) = (\tau/2\varepsilon)\exp(i\omega t)(-ic/\omega)\exp(-i\omega x/c)]$

$\phi(x;t) = (\tau c/2\varepsilon i\omega)\exp(i\omega[t-x/c]) = (\tau/2\varepsilon ik)\exp\cdot i(\omega t-kx)$.

$D(t-x/c) = -\varepsilon\,\mathrm{grad}\,\phi(x;t) = (\tau/2)\exp(i\omega[t-x/c])$

, while it must be $D(t, x=0) = \tau(t) = \tau\exp(i\omega t)$ at the surface of radiator.

2 is due to double charged surface solution, so we should take as folows

$\phi(x;t) = (1/\varepsilon i(\omega/c))\,\tau\exp(i\omega[t-x/c])$. $\longleftarrow$ $\tau(t) = \tau\exp i\omega t$.

$*\int_x^\infty dr.\exp(-i\omega r/c) = (-c/i\omega)\exp(-i\omega r/c)\big|_x^\infty$

$= (-c/i\omega)[\exp(-i\omega\infty/c) - \exp(-i\omega x/c)] = (-ic/\omega)\exp(-i\omega x/c)]$.

$*\,D(t-x/c) = \tau\exp(i\omega[t-x/c]) = -\varepsilon\,\partial_x\phi(t-x/c)$.

$\phi(t-x/c) = -(\tau/\varepsilon)\int_{-\infty}^x dx.\exp(i\omega[t-x/c]) = (\tau c/\varepsilon i\omega)\exp(i\omega[t-x/c])\big|_{-\infty}^x$

$\phi(x;t) = (\tau c/\varepsilon i\omega)\exp(i\omega[t-x/c])$. ⟨⟨single charged surface solution⟩⟩

(b) $\tau = \tau(t)$. ⟨⟨**general solution** by $d\Xi(t)/dt = \tau(t)$⟩⟩

$\phi(x;t) = (c/2\varepsilon)\,\Xi(t-x/c)$.

$\phi(x;t) = \oiint dS'\,\tau(t-r/c)/4\pi\varepsilon r = \int_x^\infty dr\cdot 2\pi r\cdot\tau(t-r/c)/4\pi\varepsilon r$

$= (1/2\varepsilon)\int_x^\infty dr\cdot\tau(t-r/c) = (-c/2\varepsilon)\int_{t-x/c}^{-\infty} dR\cdot\tau(R) = (c/2\varepsilon)[\Xi(t-x/c) - \Xi(-\infty)]$,

, where we take $\Xi(-\infty) = 0$.

$\phi(x;t) = (c/\varepsilon)\,\Xi(t-x/c)$.

$*\,R = t-r/c$, $dr = -c\,dR$, $d\Xi/dR = \tau(R)$.

(c)**charge**$=Q$ **on radiator(anode)of Capacitor**$=C_A$.

$\phi(x=0;t)=Q(t)/C_A$.

$\phi(x;t)=Q(t-x/c)/C_A=(c/\varepsilon)\,\Xi(t-x/c)$.

$\Xi(t-x/c)=Q(t-x/c)\,(c/\varepsilon C_A)$.

$\tau(t)=d\Xi(t)/dt=(c/\varepsilon C_A)\,dQ(t)/dt$

(3)Any plane solution must be $\Box\phi(t-x/c)=0$. <<source-less solution>>
This is rather courious,because we derive "with source solution" from (1).This curiosity may be due to taking $\exp(-i\omega\infty/c)$, $\Xi(-\infty)=0$. <<radiator edge effect>>

-chapter 3 summary-

(1) $\phi(x;t)=(c/\varepsilon)\,\Xi(t-x/c)$. $\langle d\Xi(t)/dt=\tau(t)\rangle$

(2) $\phi(x=0;t)=Q(t)/C_A$.

(3) $\tau(t)=d\Xi(t)/dt=(c/\varepsilon C_A)\,dQ(t)/dt$

"That is,potential $\phi(t-x/c)$ *and anode charge* $Q(t-x/c)$ *are proportional"in plane wave .*

TOP WARNING to readers in laboratory

As you know well,Hydrogen Gas is likely to be explosive !!!!,Check leakage and fire sources,
Protect your eye by face guard helmet,etc.

[４]：How to design positive unipolar pulse of " j_B".

Our final aim is design of **pulse current density** $j_B=c\rho_B$. Following are those tools.

The pulse height,width,shape and rate must be determined by considering **chemical reaction** affairs(version 3).

(1)What we could understand as for 1dimensional "plane wave propagation".

Travelling wave $\phi(t-x/c)$ depends on source $Q(t)$ lineary with time lag $[t-x/c]$.

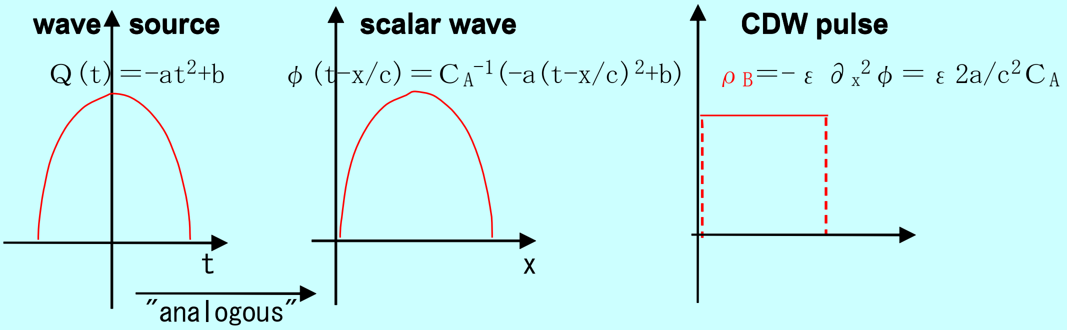
That is, $\phi(t,x)$'s space change is similar to source $\rho(t)$'s time change.

$\partial_x\phi(t-x/c)=-\partial_t\phi(t-x/c)/c.$

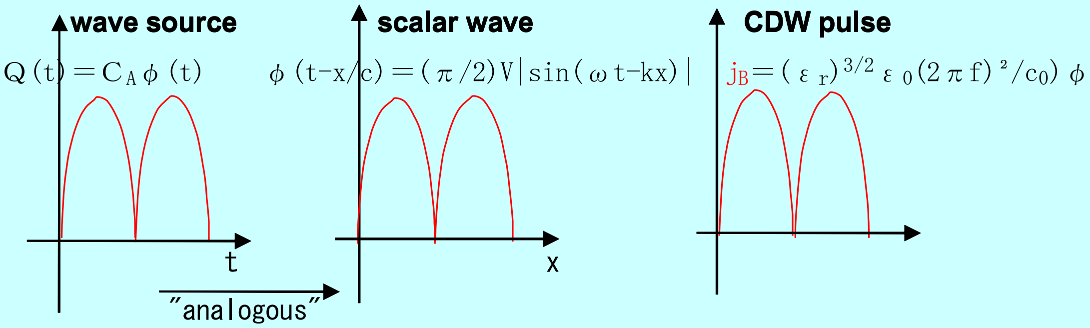
$\partial_x^2\phi(t-x/c)=(1/c^2)\partial_t^2\phi(t-x/c).$ <<wave equation itself>>

$\rho_B=-\varepsilon\partial_x^2\phi(t-x/c)=\varepsilon\partial_t\partial_x\phi(t-x/c)/c=-\partial_tD(t-x/c)/c=j_B/c. \rightarrow j_B=c\rho_B.$

(2)How to design ρ_B.



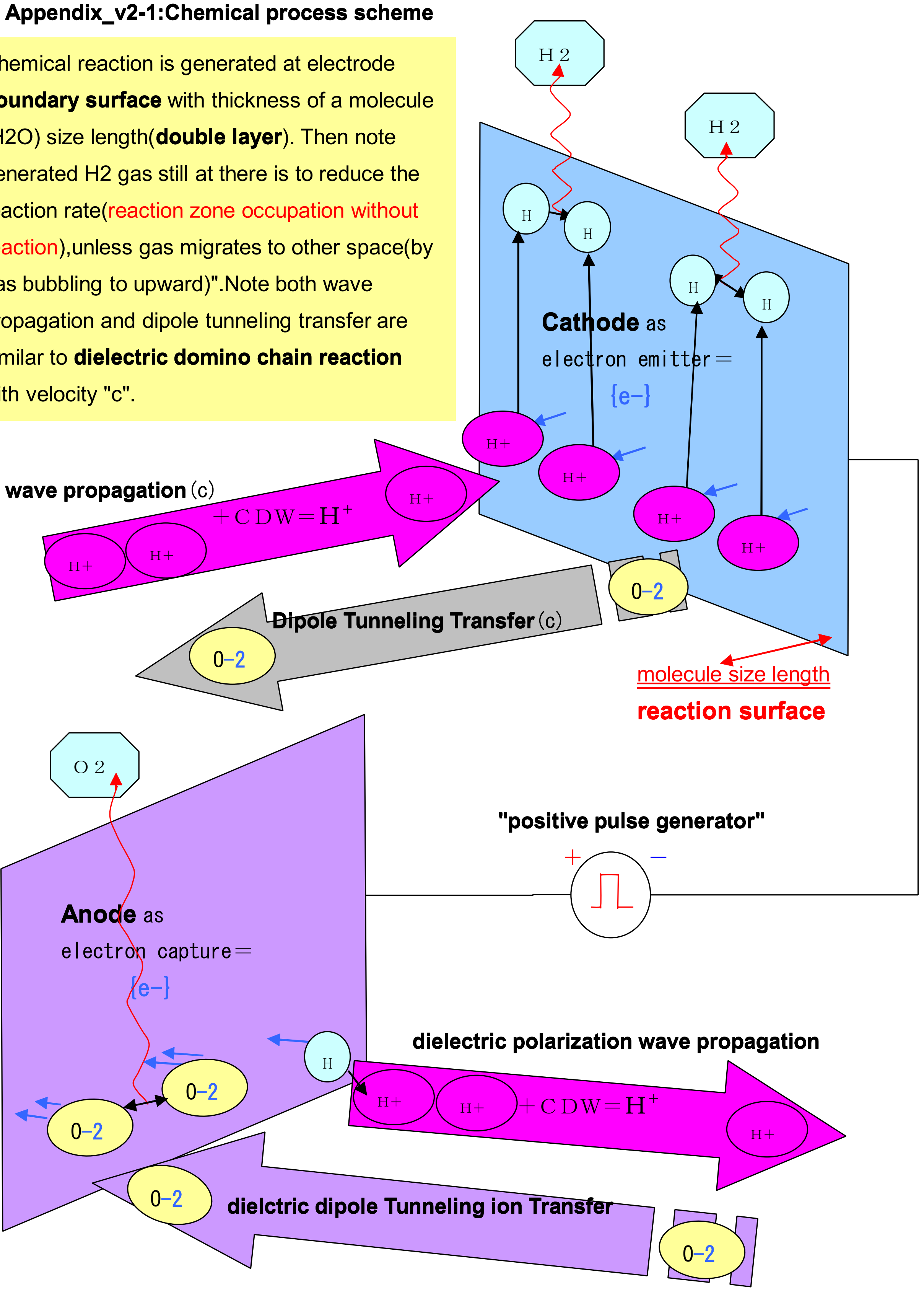
(3)How to design j_B. "rectified sine wave might be best for implementation"



＊In version 2,author metioned only plane wave,because it is primitive and easy to analysis.,but could not mention inner sylinderical wave which is more pragmatical,

Appendix_v2-1:Chemical process scheme

Chemical reaction is generated at electrode **boundary surface** with thickness of a molecule (H2O) size length(**double layer**). Then note generated H2 gas still at there is to reduce the reaction rate(reaction zone occupation without reaction),unless gas migrates to other space(by gas bubbling to upward)".Note both wave propagation and dipole tunneling transfer are similar to **dielectric domino chain reaction** with velocity "c".



Appendix_v2-2:Mathematical notations

<$i\equiv\sqrt{-1}$, Greek: μ, $_{\mu}$, ν, $_{\nu}=0,1,2,3$; Latain:$k, l=1,2,3$(space index)>.

$x_{\mu}\equiv(x_0=ict, x_1, x_2, x_3)\equiv(x_0, \mathbf{x})\equiv(x_0, x_k)$.

$A_{\mu}\equiv(A_0=i\phi/c, A_1, A_2, A_3)\equiv(A_0, \mathbf{A})\equiv(A_0, A_k)$.

$j_{\mu}\equiv(j_0=ic\rho, j_1, j_2, j_3)\equiv(j_0, \mathbf{j})\equiv(j_0, j_k)$.

$\partial_{\mu}\equiv\partial/\partial x_{\mu}$; $\partial_x\equiv\partial/\partial x$; $\partial_t\equiv\partial/\partial t$; $\partial_t{}^2\equiv(\partial/\partial t)^2$

$\partial_k{}^2\equiv\partial_k\partial_k\equiv\Sigma_{k=1}{}^3\partial_k{}^2\equiv\Sigma_{k=1}{}^3(\partial/\partial x_k)^2$. <sumation on double index" k">

$\square\equiv\Sigma_{\mu=0}{}^3\partial_{\mu}\partial_{\mu}\equiv\partial_{\mu}\partial_{\mu}\equiv-c^2\partial_t{}^2+\mathrm{div.grad}\equiv-c^2\partial_t{}^2+\triangle$.

$\mathbf{r}\equiv(x_1, x_2, x_3)$.

$\oiiint dx_1dx_2dx_3\equiv\oiiint x^3\equiv\oiiint dr^3$.

<$c=1/\sqrt{(\varepsilon\mu)}$≡velocity of light, ε≡permittivity, μ≡permeability>

vaccume constant : $\varepsilon_0=8.85\mathrm{X}10^{-12}$F/m; $\mu_0=4\mathrm{X}10^{-7}$H/m. $c_0=2.998\mathrm{X}10^{8}$m/s

postscript::

This is also work in short days,so readers must take caution carefully on author's errors.

Now some parts of version-1 was found to be incomplete,however which is to be left as it was.As you have known at this time,output power(the kernel of our mission)is rather small.

Note charge density wave(CDW)must not be outleakaged to exterior enviroments,
but must be completely confined and terminated in device.

Water Electrolysis by Charge Density Wave could Create Energy(v1). 2012/7/22,23,27

WFC can generate hydrogen gas by less energy input ,and the gas can generate more energy output than input one.

http://www.panaceauniversity.org/Ravi%20Cell.pdf

＊This converts to 4.66 CC of H2/sec which converts to 16.776 Lits / hour 16.776 x 2.4 watts (Faraday/lit/hour generation) = 40.262 Watts. Ravi seems to be generating the equivalent of 40.2 watts as per Faraday with just 6.12 Watts. This would mean he is generating 550% excess as the above works out to 40.2/6.12 x 100 = 656.86%656.86 - 100 (Faraday) = 556.86% OU !! .

＊It's not fraud,but fact. **Yull Brown's Gas or Stanley Meyer's Water Fuel Cell(WFC)** could be emergent salvation for the world facing deadly climate caused by carbon energy.
http://waterfuelcell.org/index.htm
http://www.panacea-bocaf.org/meyerswatercell.htm

＊The WFC (Water Fuel Cell) based on the work of Stanley Meyer uses ordinary tap water or distilled water, this is not a common Faraday electrolysis process, the WFC uses the parametric resonance effect with High Voltage and Low Current to split the water molecule.
http://jnaudin.free.fr/wfc/index.htm

－Ａuthor's modified summary－

WFC uses ordinary water **without conductive electrolyte**, this is not a common Faraday (DC＝**direct current) electrolysis process**, but the WFC uses unipolar pulse of **charge density wave**(**CDW**) with resonance effect with High Voltage to split the water molecule. Then CDW can be radiated **by nothing input energy** but except dielectric loss of water.Now author try to expose you that................

[１]：CDW could be radiated into water by nothing energy but conductive loss one.
[２]：CDW could generate hydrogen gas from water splitting .
[３]：Consequently, output energy of generated gas could be more than input one.

[０]：Physical chemical property of water in electrolysis(the introduction).

Note that [output gas energy]/[input energy for gas generation]≦83％.

In ordinal water electrolysis by DC current method,we **never could create energy** at all **!!.**

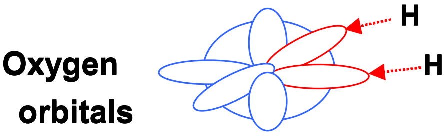
⑴**Electrolysis of Water**

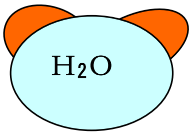
http://hyperphysics.phy-astr.gsu.edu/hbase/thermo/electrol.html

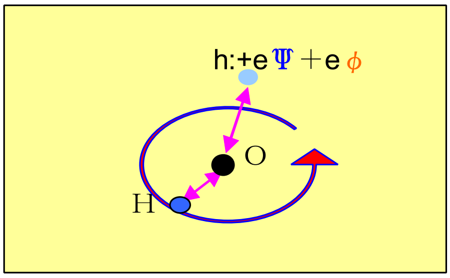
⑵**Thermodynamics of the process**

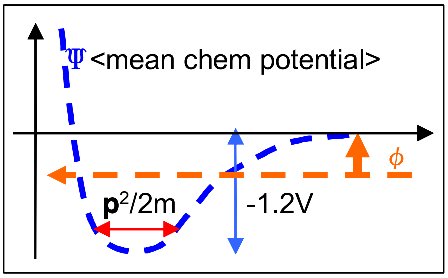
http://en.wikipedia.org/wiki/Electrolysis_of_water

⑶**Oxygen:O**$2s^2 2p^4$. **electrons configuration and molecule sphere**



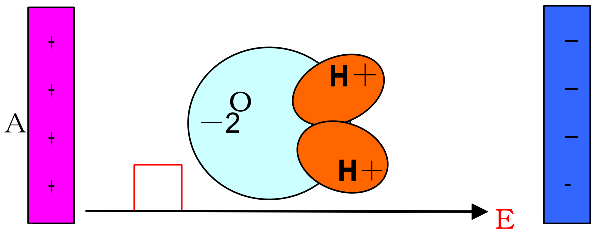






For simplification,we assume **hydorogen diassociation**(≡h) from water molecule (≡H_2O)is reaction hHO+**φ**→HO+h ,where H_2O=hHO、"h" is hydrogen ion. ϕ is **injecting CDW**(Charge Density Wave) of exciting potential ϕ ,Ψ is chemical bonding potential<between h and HO> in the mean field intensity.Note Ψ is negative energy,so ϕ must be positive energy(induced positive ion charge density wave,but not electron charge density one) to cause chemical dissociation of "h".

⑷**charge configuration in water molecule sphere in electrical field.**



C

Let's imagine what will happen by igniting electric field E？.

H+ is pulled out from H_2O**.**

Then note oxygen is 16 times heavier than hydrogen.

Above is the fundamental schme of **polarized water molecule** in electric field.

Therefore,according to direction of E ,polarized water molecure is to turn its orientation.

Which causes larger relative permittivity of water(80) and dielectric loss in high frequency.

Because the rotation need energy,which turn to become heat at last(**Q loss energy**).

[1]: CDW could be radiated into water by nothing energy but conductive loss one.

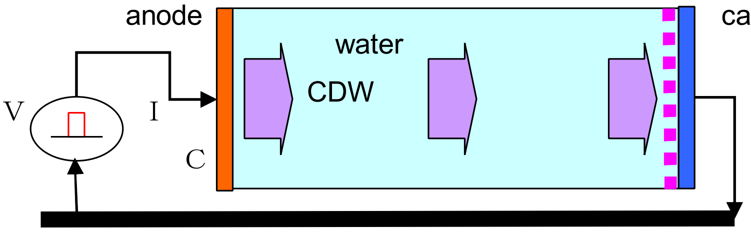
http://www.777true.net/BWG.pdf

CDW was originally found by N.Tesla as scalar wave ϕ described by the Maxwell Equation.

$\Box\phi(x, t)=-\rho(x, t)/\varepsilon$. <longitudinal charge density wave radiated from charge ρ>

$\Box A(x, t)=-\mu j(x, t)$. <This is well known transversal electromagnetic wave by j>.

(1)**CDW radiation from anode electode antenna toward cathode reaction space(RS)**.



Anode and cathode are conductive methal.Pulse CDW is radiated from anode by voltage source V with charging current= I ,which accumulate charge $Q(t)=\int_0^t du\, I(u)$, $V(t)=Q(t)/C$,where C is capacitive of anode antenna.Pink dots space is reaction one where hydorogen gas is generated.While remoted anode generate oxygen gas simuletaneously.

Why CDW could be created from nothing is described in above site.Summary to tell,

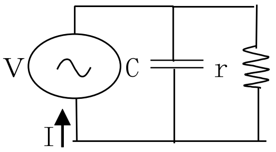
$0=+E$ (availabel positive energy) $-E$ (negative energy by attractive electrical force).

Finally the latter become gravitational field energy in this univers,where

$0=+E$ **(positive matter energy)** $-E$ **(negative energy of gravity field)**.

Then note that every interaction of electromagnetic,weak and strong force in nuclear are all same member of unified quantum gravity field SO(11;1).Therefore electrical energy increase of $\Delta E=\Delta mc^2$(Einstein).Which is to become mass increase Δm that generate negative energy of gravity field so as to $\Delta E_m+\Delta E_G=0$.

(2)**The meaning of conductive loss energy in capacitive radiator antenna**.

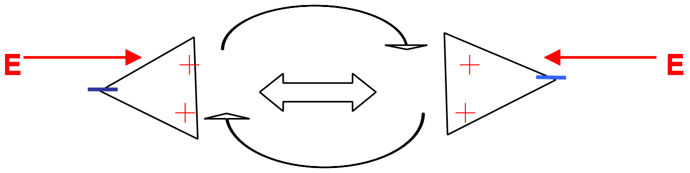


＊**CDW antenna imittance** $Y=1/r+j\omega C\equiv I/V$

＊pure capacitor=$j\omega C$ never consume energy

＊resitor r consume power $P=V^2/r$.

(3)conductive loss="r" is caused by frictional rotational dynamics of water molecule by alternate electrical force **E**. Triangle is water molecule with **polarized charge** ±.



(4)$Q = r/(1/j\omega C) \fallingdotseq 1$ ($f = 200\mathrm{MHz}$. $T = 15℃$) by authors experience.

Therefore energy loss by Q of water is not small in high frequency.

(5)In order to evade **Q loss**,applied electric field must not be ± alternate, but **unipolar**.

Unipolar pulse driving with dominant unipolar DC(polarized water biasing)is good.

(6)**Wave-nization,but not Static field-nization for energy creation by CDW.**

(a)**Maxwell Equation for sclar field ϕ (CDW) caused by exciter source $= \rho$.**

$\square \phi(x,t) = -\rho(x,t)/\varepsilon(x)$. $\Leftrightarrow$ $\phi(x,t) = \oiiint dv\, \rho(x', t-R/c)/4\pi\varepsilon R$. $\langle R \equiv |x-x'| \rangle$.

(b)**wavenized field where** $0 = -\mathrm{E} + \mathrm{E}$.

$\square \mathrm{E}_1(x,t) = \mathrm{grad}\,\rho(x,t)/\varepsilon$. $\Leftrightarrow$ $\mathrm{E}_1(x,t) \fallingdotseq \oiint dS' \{\tau(x', t-R/c)/4\pi\varepsilon\delta R\}$。

derivation)

$\mathrm{E}_1(x,t) = \oiiint dv\,\mathrm{grad}'\,\rho(x', t-R/c)/4\pi\varepsilon R$. $\langle R \equiv |x-x'| \rangle$.

$= \oiiint dv\,\mathrm{grad}' \{\rho(x', t-R/c)/4\pi\varepsilon R\} - \oiiint dv\,\mathrm{grad}' \{\rho(x', t-R/c)\,\mathrm{grad}\langle 1/4\pi\varepsilon R\rangle$

$= \oiint dS' \{\rho(x', t-R/c)/4\pi\varepsilon R\} + \oiiint dv \{\rho(x', t-R/c)\langle \mathbf{R}/8\pi\varepsilon R^3\rangle$

$= \oiint dS' \{\tau(x', t-R/c)/4\pi\varepsilon\delta R\} + \oiint dS' \{\tau(x', t-R/c)\langle \mathbf{R}/8\pi\varepsilon R^3\rangle$

$\fallingdotseq \oiint dS' \{\tau(x', t-R/c)/4\pi\varepsilon\delta R\}$。

* $\rho\delta = \tau$. $\langle \delta =$ skin depth, $\tau =$ surface charge density$\rangle$

Electric force $\mathrm{E}_1(x,t)$ is essential for polarization and the chemical reaction for water splitting.Then note that static term $= \langle \mathbf{R}/8\pi\varepsilon R^3 \rangle$ could not be energy free field.But $(1/\delta 4\pi\varepsilon R)$ term enable as **wavenization field**,where energy density could be 0.

(c)**Energy conservation low in {B,φ} Longitudinal Wave Propagation.**

$\square \phi(x,t) = 0$. $\langle\langle$wavenized field $\phi\rangle\rangle$

$\mathscr{H}_S = -(\varepsilon/2c^2(\partial t\phi)^2 + \tfrac{1}{2}\mathrm{E}_1\mathrm{D}_1) + \{\rho_B\phi\} = 0$.

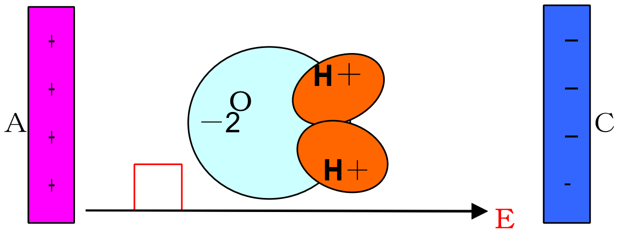
$0 = \quad -\mathbf{E} \qquad\qquad + \mathbf{E}$

Negative energy density of attraction force generated in dielectric dipole field.	positive energy density generated by accumulating same charge in same points.

Plane wave could be zero field in above realtion.General wave is superpostion of each plane wave components,so those also could be zero energy density field.

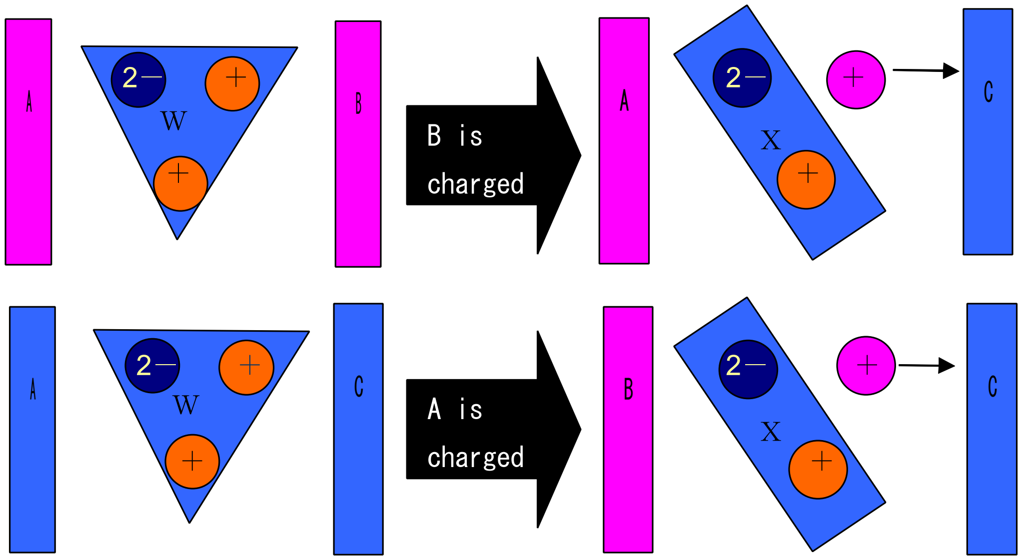
[２]：CDW could generate hydrogen gas from water splitting .

(1)charge configuration in water molecule sphere in electrical field.



Above is the fundamental schme of **polarized water molecule** in electric field. Therefore,according to direction of Ｅ,polarized water molecure is to turn its orientation. Which causes H+ pulled out from water(disassociation reaction).$H_2O \rightarrow HO^- + H^+$.

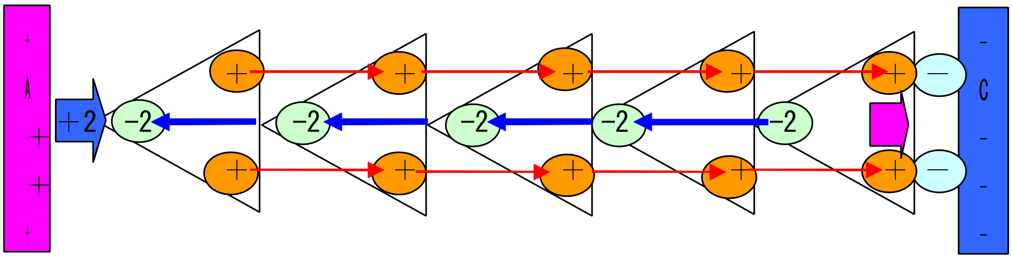
(2)Frank-Condon Principle＝Preceeding One Of Electron Cloud Shift.



Above is a very coarse model of water splitting by electric field applying. Circles (2-) is **oxygen**,(+) are **hydrogen** of charged atroms,while blue zone{W,X,A,B,C} are **electron clouds** in molecular.If B(A) became charged C(B),then W changed to X instantaneously(vertical transition),consequently isolated ⊕ is to move toward C.This process is way of chemical reaction called **Frank Condon Principle** as principle of preceeding of **electron cloud shift** to form following molecule formantion in chemical reaction.That is,chemical reaction is dominated by dynamical stability seeking by flexible electron clouds which is to prepare following nuclei configuration in molecule.

＊{W→X} change is caused by {A→B}<repulsive force between electron clouds>,which is called instanteneous vertical transition estimated about 10^{-12}sec order.While that of nuclei may be more than 1000 times longer.This fact could imply **chemical reaction time**＝τ_R.

(3)**Long string polarization could cause water splitting.**



Triangle means water molecule with an oxygen and two hydrogens.

Positive Charge Pulse Propagation toward right to cathode "C" is by hydorogen ⊕

While negative oxygen propagate towar left to anode"A" is by oxygen (-2)

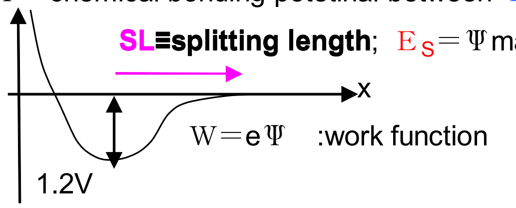
Note the propagation is **domino sucession** denoted by arrows.

(4)**Reaction Space**=electric intensity $E=-\mathrm{grad}\,\Psi$ between Electrode(-) and Liquid volume contacting surface is to cause instantaneous **Electron Cloud Change to make form for following molecule configuration,**which is to pull out nuclei $H+$ from H_2O, but not O^{-2}**.** Because latter is 16times heavier than former.

$H_2O \rightarrow HO- + H+$, $2H^+ + 2e^{-1} \rightarrow H_2$ gas at cathode.

Ψ =chemical bonding potetinal between $HO-$ and $H+$.

SL≡splitting length; $E_S = \Psi \max/SL$ =electric filed intensity for SL.



Original reaction(man made): $H_2O \rightarrow H^+ + HO^-$,

Water and O_2 generation : $4HO^- \rightarrow 2H_2O + 2O^{-2} \rightarrow 2H_2O + O_2 - 2e^{-1}$. (spontaneous)

Totatal reaction : $4H^+ + \underline{4HO^-} \rightarrow 4H^+ + \underline{2H_2O + 2O^{-2}}$.

(5)**qusi-transfer mechanism<quick and lossless diple chain tunneling>**:

$HO-$ generated at anode is **qusi-transfer** toward anode from **cathode the reaction space**.

⊕$\{H_2O-H_2O-H_2O-H_2O-H_2O-H_2O\}$⊖ is original dipole chain by DC bias.

$H^+ + HO^- - H_2O-H_2O-H_2O-H_2O-H_2O$: WS reaction at cathode.

(Ⅰ)$HOH-HO^- - H_2O-H_2O-H_2O-H_2O$: **diple chain tunneling** of HO^-.

(Ⅱ)$OH_2-OH_2-HO^- - H_2O-H_2O-H_2O$

$OH_2-OH_2-OH_2-HO^- - H_2O-H_2O$

……………………………………

(Ⅲ)$OH_2-OH_2-OH_2-OH_2-OH_2-OH^- \rightarrow 4HO^- \rightarrow 2H_2O + 2O^{-2} \rightarrow 2H_2O + O_2 - 2e^{-1}$. ${}_2$

O_2 gas at anode.

Note OH- could be replaced also by O^{-2}..

＊the mechanism **diple chain tunneling** is cited from Quantum Electro-Dynamics of non-localized Dipole Field by author(1992).

鈴木基司, 非局所的双極子場の量子論, 1992<改定中>, 時事問題解析工房.

(6)Mentioned in above schemes are all that author imagined,but not assured !!!.

Author had nothing real experiences in chemistry.,so the matter must be reexamied by experts.

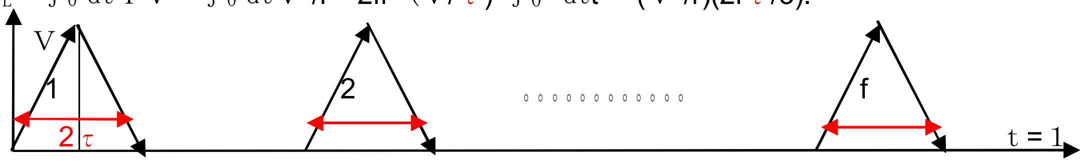
[3] : Consequently, output energy of generated gas could be more than input one.

(1)$I_r = V/r$:Q loss current by "r." $Q = r/(1/2\pi fC)$. $r = Q/2\pi fC$.

☞: Q is decisive essential factor for critical output energy＞input energy. Q of water is caused from **molecular rotation** by field,so unipolar electric field is favarable.

(2) $P_L = I_L V$: **power loss in CDW exitation source**.<V =max volt in pulse one>

$$P_L = \int_0^1 dt\ I\ V = \int_0^1 dt\, V^2/r = 2fr^{-1}(V/\tau)^2 \int_0^\tau dt\, t^2 = (V^2/r)(2f\tau/3).$$



example1) $f = 1MHz$, $V = 100V$、 $C = 1\mu$. → $r(Q) \equiv 10\Omega$ <≡an assumption>

→ $100^2/10 \times (2f\tau/3) \sim 330W$. <$f\tau \equiv 0.5$>

(3)$I_C = KCdV/dt$. : substantial radiation current by plane wave propagation.

$K = f\tau$ =pulse duty ratio: τ =rise time and f =pulse rate/sec.

$I_C = KCdV/dt = f\tau C(V/\tau) = fCV = V/(1/fC)$.

☞:$dV/dt < 0$,pulse down current is not counted in above calculation !!.

example2) $f = 1MHz$, $V = 100V$、 $C = 1\mu F$。 → $I_C = 100A$.

example3) $f = 1MHz$, $V = 100V$、 $C = 1mF$。 → $I_C = 100000A$.

(4)1mole H_2 output gas energy : $E_{H2} = 237.13\ kJ/2g = 1.2V \times 3600 \times$**55**$A/2g$.

(5)H_2 gas generation rate/sec $M_{H2} = 2g \times I_C/2eN_A$.

$e = 1.602 \times 10^{-19}C$、 $N_A = 6.02 \times 10^{23}/mol$、1mol charge of $e = eN_A = 96500C/g$ 当量≡$\mathcal{F}$

(6)**Output Gas Power** $P_{H2} = E_{H2} \times M_{H2} = E_{H2} I_C/eN_A = 2.46 I_C$ watt.

example4) $I_C = 100A$. → $P_{H2} = 240$watt.

(7)Q loss estimated by Ravi' experiment efficiency 500%.

$f = 1MHz$, $V = 100V$、 $C = 1\mu F$、 $1/fC = 1\Omega$、 $(2f\tau/3) \equiv 1/2$、

$P_L = (V^2/r)(2f\tau/3) \equiv V^2/2r. \equiv 50W$. → $r = 100\Omega$

☞: In this case,lossful water molecule rotation never could be !.

Discussion Note:

⑴Author convince **CDW could be generated from nothing energy.**

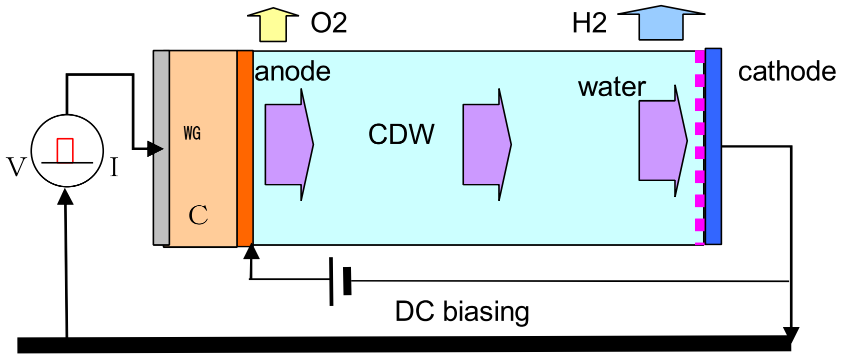
Also unipolar pulse CDW could generate hydrogen gas.

⑵However,at this time,he noticed large risk of **loss energy** by water at radiation antenna.

Because the Q of water is not so high<If not so,water could be cheap capacitors>.

The loss is due to **molecular rotation**,so sufficient **DC biased field** is decisive to intercept the rotation.

＊Once wavenized CDW could penetrate any matter except conductive methal connecting to ground.So there is another possibility for evading Q loss in input stage. it is separation of **anode for DC biasing** for causing string polarization of water and **unipolar CDW radiation antenna** behind the anode.(**post radiator**).



WG is lossless wave guide of CDW. Note the water is without conductive electrolyte.

This method might can evade those patents(2012/7/26)

⑶Stanley Meyer's **unipolar pulse method** seems very reasoable in these meaning.

Cylinderical capacitor method is good to generate strogn reaction field at cathode.

Resonance is essential to establish high Q circuit of **lowest energy loss**.

Historically **Yull Brown** is the original founder of water fuel,however,his method could not be seen in websites.By anyhow the great works by both of them,

we could turn **the upside down world !. Very Thanks for their great devotions !!**

⑷Nothing refering on the **fulid(gas bubble) flow** in **chemical reaction field**.

This would be indispensable in **quick and large gas generation**

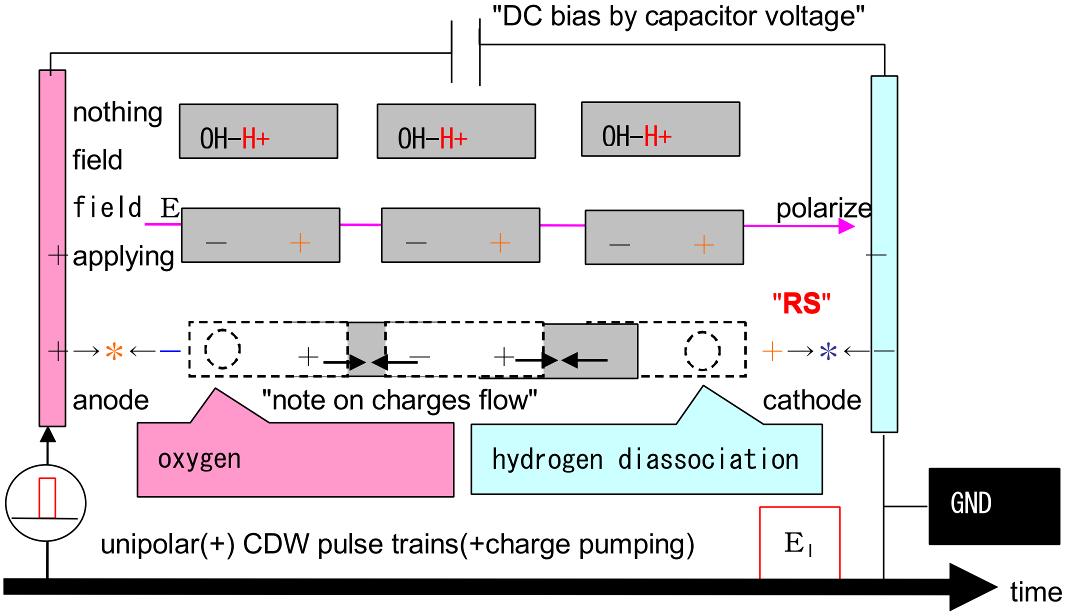
Appendix-1:Design Basics of CDW radiation and propagation.

The fundamental details could be seen in this site.

http://www.777true.net/BWG.pdf

[０]：Localiazed field of CDW could cause water splitting.

Longitudinal CDW is electric field E_l only ,but without magnetic one as transversal electromagnetic wave stimulated by current density.It is chain field of polarized dipoles domino field with E_l.Then note **supreme polarization at cathode** is to be hydrogen disassociation from water.



Note hydrogen diassociation at cathode(reaction space＝**RS**) is essential,which turn to generate oxygen one at anode by dipole tunneling(seudo ion transfer from right to left).In order to establish RS,there would be stronger critical intensity of field E_l.Then note the E_l does not need global from anode to cathode,but local as within "RS".This fact could support water splitting by CDW pulse wave,which could be localized the E_l.

☞:Caution:Author have no experience in chemistry,so physical chemical process mentioned In above are all his imaginations.

[1]: Maxwell Equation for sclar field ϕ (CDW).

(1)**Maxwell Equation for sclar field ϕ (CDW) caused by exciter source $= \rho$.**

$\Box \phi(x,t) = -\rho(x,t)/\varepsilon(x). \quad \Leftrightarrow \quad \phi(x,t) = \oiiint dv\, \rho(x', t-R/c)/4\pi\varepsilon R. \quad \langle R \equiv |x-x'|\rangle.$

(2)$D_1 = \varepsilon E_1 = -\varepsilon \,\mathrm{grad}\,\phi.$

(3)$\rho_B = \mathrm{div} D_1. \quad \Leftrightarrow \quad \partial_t \rho_B + \mathrm{div}\, j_B = 0.$

(4)$j_B \equiv -ic.\,\mathrm{grad}\,B = \varepsilon\, \partial_t \mathrm{grad}\,\phi = -\partial_t D_1.$

(5)$\Box D_1 = \mathrm{grad}\,\rho.$

(6)$\Box \rho_B = \mathrm{divgrad}\,\rho.$ "CDW Equation stimulated by real charge density ρ".

(7)**plane wave**: $\phi(x,t) = A\exp j(kx - \omega t)$

(8)$j_B \equiv -ic.\,\mathrm{grad}\,B = \varepsilon\, \partial_t \mathrm{grad}\,\phi = \varepsilon k \omega \phi = \varepsilon (2\pi f/c) \omega \phi = (\varepsilon/c) \omega^2 \phi.$

(9)**characteristic impedance of wave gude**<pure plane wave>.

$Z_C \equiv \phi / I_B = \phi / I\, S j_B = c/\varepsilon S \omega^2 = 1/\mu^{1/2} \varepsilon^{3/2} S \omega^2.$

(10)**impedance change by reflection due to mismatching**.$< \Gamma(x) = (B/A)\exp(-2jkx) >.$

$\Box \phi(x,t) = 0.$

Once ϕ had become wavenized,considertation on reflection wave in propagation is essential.This is entirely analogous with wellknown transmittion line theory.

$\phi(x) = A\exp(jkx) + B\exp(-jkx).$.

$I(x) = (A/Z_C)\exp(jkx) - (B/Z_C)\exp(-jkx).$

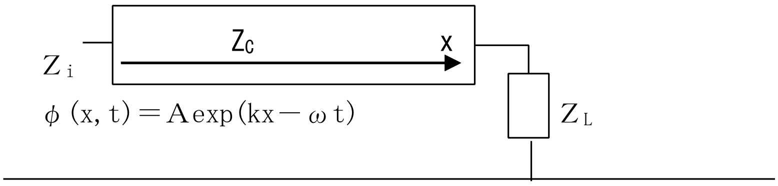
$Z_L(x)] = \phi(x)/I(x) = Z_C[1+\Gamma(x)]/[1-\Gamma(x)].$ <load impedance at x>

$\Gamma(x) = (Z_L(x) - Z)/(Z_L(x) + Z) = \Gamma(0)\exp(2jkx).$ <reflection ratio at x>

$\Gamma(0) = \Gamma(x)\exp(-2jkx).$

$Z_i = \phi(0)/I(0) = Z_C[1+\Gamma(0)]/[1-\Gamma(0)].$

$$Z_i = Z[1+(Z_L - Z)\exp(-2jkx)/(Z_L + Z)]/[1-(Z_L - Z)\exp(-2jkx)/(Z_L + Z)]$$
$$= Z_C[Z_L + Z_C \tanh(-2jkx)]/[Z_C + Z_L \tanh(-2jkx)]$$
$$\fallingdotseq Z_C[Z_L + jZ_C \tan(-2kx)]/[Z_C + jZ_L \tan(-2kx)]。$$
<input impedance by lossless>



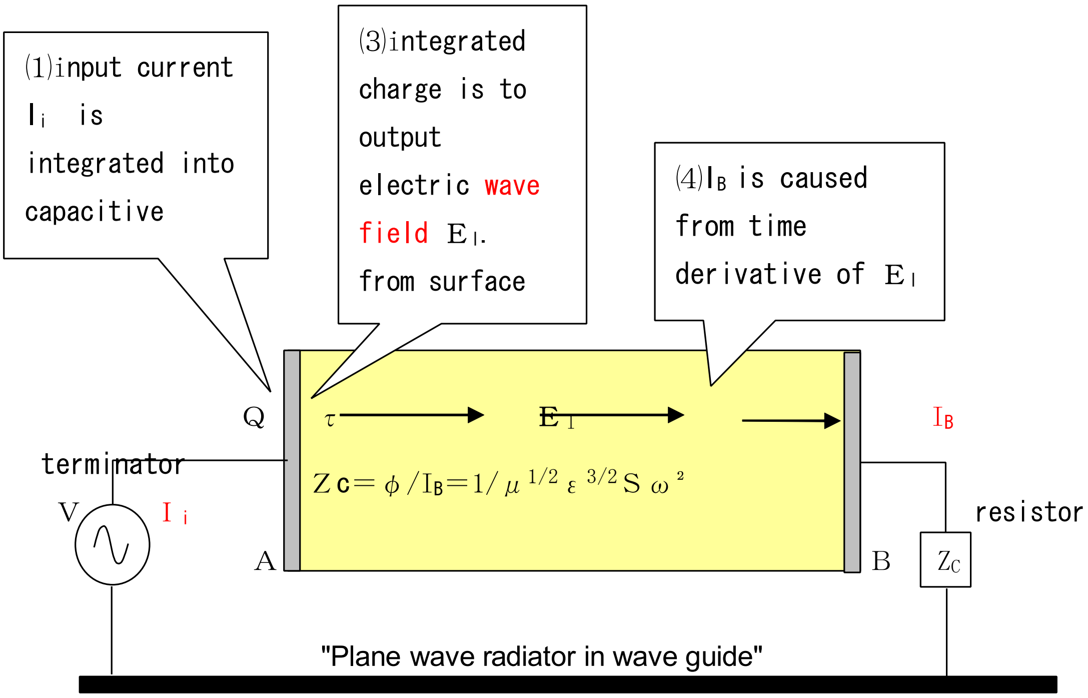
(11)Difference of input impedance between being radiator and being wave guide.
See fig in **Discussion Note:**(2),where anode is radiator(capacitive input impedance), while it could be also wave guide(charcteristic impedance) as for radiator behind.
The former is static,while latter is wavenized.

[2] : Process of CDW radiation as polarized current I_B from charging one I_i.

Ⅰ : plane wave propagation.

Following are a CDW radiator(antenna) of rather idealized model.

To tell it precisely would take more complicated analysis.



"Plane wave radiator in wave guide"

(1) $Q = \int_0^t dt\, I_i$.

(2) Note that current continuation low of $I_i = I_B$.

$I_i = CdV/dt = j\omega CV. \rightarrow Z_i = V/I_i = -j/\omega C = -jZc$.

$I_i = I_B. \qquad \rightarrow C = 1/\omega Zc = \mu^{1/2} \varepsilon^{3/2} S\omega$.

(3) $\mathbf{E}_1(\mathbf{x}, t) = \iiint dv\, \mathrm{grad}' \rho(\mathbf{x}', t - R/c)/4\pi\varepsilon R. \quad \langle R \equiv |\mathbf{x} - \mathbf{x}'|\rangle$.

$= \iiint dv\, \mathrm{grad}' \{\rho(\mathbf{x}', t - R/c)/4\pi\varepsilon R\} - \iiint dv \{\rho(\mathbf{x}', t - R/c)\, \mathrm{grad}' \langle 1/4\pi\varepsilon R\rangle$

$= \oiint d\mathbf{S}' \{\rho(\mathbf{x}', t - R/c)/4\pi\varepsilon R\} + \iiint dv \{\rho(\mathbf{x}', t - R/c)\langle \mathbf{R}/8\pi\varepsilon R^3\rangle$

$= \oiint d\mathbf{S}' \{\tau(\mathbf{x}', t - R/c)/4\pi\varepsilon\delta R\} + \oiint d\mathbf{S}' \{\tau(\mathbf{x}', t - R/c)\langle \mathbf{R}/8\pi\varepsilon R^3\rangle$

$\fallingdotseq \oiint d\mathbf{S}' \{\tau(\mathbf{x}', t - R/c)/4\pi\varepsilon\delta R\}$.

$* \rho\delta = \tau$. {δ = skin depth, τ = surface charge density}.

(4) $j_B = -\partial_t \mathbf{D}_1 = -\varepsilon \partial_t \mathbf{E}_1$. ⟨polarized current density⟩

(5) $I_B = S j_B$. ⟨S = cross surface of wave guide⟩

(6) $\phi = Zc I_B = V$.

(7) $Zc = \phi / I_B = 1/\mu^{1/2} \varepsilon^{3/2} S \omega^2$

Ⅱ：spherical wave propagation.:

(1) $\Box\,\phi(r,t)=0$.

(2) $\phi(r)=A\exp j(kr-\omega t)/r$.

(3) $E_r(r)=-\mathrm{grad}\,\phi(r)=-jkA\exp j(kr-\omega t)/r+A\exp j(kr-\omega t)/r^2$.

(4) $j_B(r)=-\varepsilon\,\partial_t E_r(r)$.

(5) $I_B(r)=4\pi r^2 j_B(r)=4\pi\varepsilon Ak\omega\exp j(kr-\omega t)r+j4\pi\varepsilon\omega A\exp j(kr-\omega t)$.

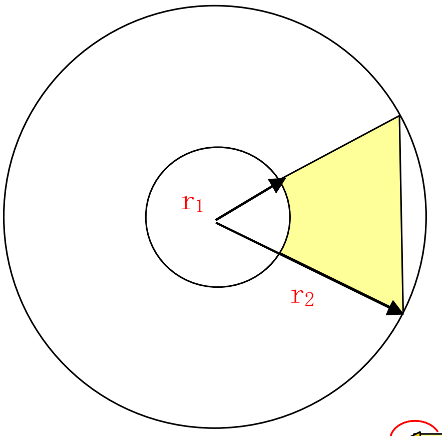
☞: In spherical wave,the 1st term(wave component) is to increase as r goes far.

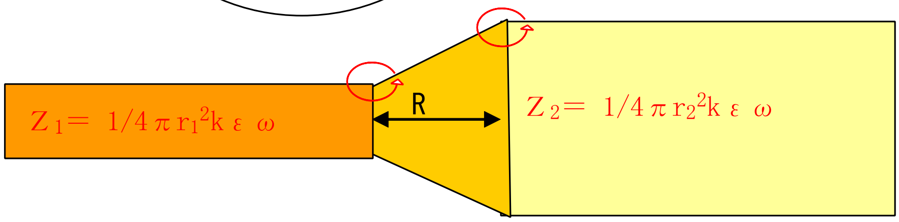
(6) $Y_B(r)=I_B(r)/\phi(r)=4\pi\varepsilon k\omega r^2+j4\pi r\varepsilon\omega$.

(7) $Z_S=1/j4\pi r\varepsilon\omega$.　<<static component>>

(8) $Z_W=1/4\pi r^2 k\varepsilon\omega$.　<<$r_c=\lambda/2\pi$, $Z_S=Z_W$>>. critical length of wave and static.

(9) **impedance matching by selecting higher and lower one by each radius＝r.**





☞: As you know,this is rather coarse approximation method.

There may be problem where WG is sharply bending(R is shorter),

☞: **As for commercial use computer simulator for EM field.**

Today computer aided design had become very popular in industry.However those are based on Clasical Maxwell Equation,but not Quantum one.If necessary,the developpment must be emergent.

☞: Note:Large volume of dielectric crystal(?) is expensive as jewel ??!!.