A creation of green energy obtained from parallel pumping by microwaves irradiation to magnetic fluid

METHOD FOR AMPLIFYING ENERGY TEMPERATURE-SENSITIVE FLUID AND CONVERTING IT INTO POWER GENERATING ENERGY

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Theme of Next generation energy
increasing world population, aged society of Japan

- Establishment of next generation sustainable energy for coexistence and co-living of human
- Energy equal opportunity distribution without depending religion, nationality, and people
- Creative new energy development for Japan in which self energy supply rate is low.
- March 11, 2011 Tohoku region earth quake and fission reactor disaster
Theme of Next generation energy
degraded Japanese technology, technology progress of under-development countries

Development energy resource without burning
development energy technology for global warming without producing CO\textsubscript{2}
Development self supply energy

Development Energy supply technology, energy consumption
(capacity, place, time)

Development sustainable Green energy
cheap facility cost, technology of sustainable energy
Factors of delayed energy development

Human’s historical Depending on burning, fire
Various cheap burning materials
Engine, internal combustion machines
Wall of classical physics and quantum physics
Big energy development of fission and fusion reactor
Development of unused quantum energy and application to energy

- History of energy academic and Nobel prizes
- (fission and fusion reaction)
- Maser and Laser
- Superconductivity and Superfluidity
- Magnetic materials and Magnetic resonance
- Nuclear magnetic resonance
- Elementary particles and symmetry breaking
Quantum energy which is already used

- Magnetic materials; motor, hard disc, EV, MRI (magnetic resonance image)
- Maser; frontier scientific heating
- Laser; laser pointer, optical drive, light fiber
- Superconductivity; MRI (magnetic resonance image), superconductive wire, linear motor
Use of quantum energy

Fission and Fusion reaction

mass defect mechanism of Einstein special relativity

Magnetic fluid generator

mass acquiring mechanism of quantum excitation of spins and plasmons by interaction of electromagnetic field and solid state as magnetic fluid, noble metal and gas

(Anderson-Kibble-Higgs mechanism based on symmetry breaking of Yoichiro Nambu)

Other example; maser, laser, superconductivity, superfluidity
Macroscopic quantum effect of microwaves irradiation to magnetic materials

- Microwaves irradiation to magnetic materials and magnetic ferrite in room temperature
- Soliton motion by coherent magnon excitation of parallel pumping amplification of magnetic resonance (as maser, laser principle)
- Excited magnons by microwaves show coherent Bose-Einstein condensation (as superconductivity and superfluidity)
- Acquiring mass by Anderson-Kibble-Higgs mechanism by N number 2 order spin systems
- Macroscopic quantum effect as macroscopic quantum tunneling
References

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Magnetic Fluid
Next generation of magnetic fluid generator

Special features (use of quantum energy)
Temperature sensitive magnetic fluid (ferromagnet)
Electric field (microwave 2.45GHz)
Magnetic resonance (permanent magnet)
Plasma (Ar gas)
Plasmon (Noble metal)
Soliton wave energy of magnetic fluid

Magnetic resonance of parallel pumping by spin excitation of irradiation microwaves to magnetic fluid applying magnetic field from outside

Excitation of magnons in coherent status of Bose-Einstein condensation
Supercurrent status of macroscopic quantum mechanism by mass acquiring mechanism of Anderson-Kibble-Higgs mechanism (other example, Superconductivity and superfluidity)

Soliton movement of magnetic fluid by magnetic resonance

Enhancement by electromagnetic field plasma of Ar gas and plasmon of noble metal of soliton motion of magnetic fluid

Energy factor
Magnetic field, frequency of electromagnetic field
**Similarity of superconductivity and magnetic fluid energy**  
*(symmetry breaking and macroscopic quantum effect)*

<table>
<thead>
<tr>
<th>Superconductivity (quantum liquid)</th>
<th>magnetic fluid electric generator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plasmon excitation of superconductor electron metal</td>
<td>plasma of Ar gas, plasmon of Noble metal</td>
</tr>
<tr>
<td>Electron mass becomes heavy by the interaction of Noble metal and with photon and superconductor (Yoichiro Nambu, Anderson)</td>
<td>Acquiring energy quantum excitation Ar gas by microwave irradiation</td>
</tr>
<tr>
<td>Spin liquid status of superconductor</td>
<td>spin excitation of magnetic fluid acquiring energy by quantum fluid by microwave irradiation</td>
</tr>
<tr>
<td>Acquiring energy by spin excitation of excitation of magnetic</td>
<td></td>
</tr>
<tr>
<td>Interaction of gauge field (electric field) and magnetic fluid (Laughlin)</td>
<td></td>
</tr>
<tr>
<td>Quantum hall effect (Laughlin) oscillation of magnetic</td>
<td>quantum hall effect, temperature, flux density, plasma and plasmon</td>
</tr>
<tr>
<td>Hall current electromotive oscillation electric field interaction of electric field and Magnetic spins</td>
<td></td>
</tr>
<tr>
<td>Persistent current</td>
<td>Lorentzian electromotive force, propelling force</td>
</tr>
</tbody>
</table>
Magnetic fluid actions

Spin motions of magnetic fluid without applying magnetic field
Magnetic fluid actions

Spin motion of magnetic fluid with applying magnetic field using permanent magnet
Motion of spins of magnetic fluid with irradiation of microwaves and applying magnetic field using permanent magnet.
Magnetic fluid actions

Temperature change

Themofluctuation
Magnetic fluid actions

Motion of spins of magnetic fluid with irradiation of microwaves, inserting Ar gas and applying magnetic field using permanent magnet

Temperature oscillation of spin of magnetic fluid
Soliton wave of magnetic fluid is amplified plasma of Ar gas

Spin rotation speed: 2500 m/s
Magnetic fluid actions

Temperature change

Thermofluctuation
Magnetic fluid actions

Motion of spins of magnetic fluid with irradiation of microwaves, inserting Ar gas, noble metal and applying magnetic field using permanent magnet.

Temperature oscillation of spin of magnetic fluid
Soliton wave of magnetic fluid is amplified plasma of Ar gas and plasmon of noble metal.
Magnetic fluid actions

Temperature change

Thermofluctuation

Temperature (℃) vs. Time (seconds) graph showing fluctuations in temperature over time.
Principle of magnetic fluid generator

Quantum mechanical energy effect
Energy conservation law is based on symmetry (Noether theorem)
Quantum electric generator based on symmetry breaking
Spontaneous symmetry breaking introduced to Particle physics
Professor of University of Chicago, Yoichiro Nambu
2008 Nobel laureate
Symmetry and Conservation law

Energy conservation law is based on the symmetry (Noether theorem)

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Author, H. Goldstein, Classical Mechanics, Addison-Wesley
Author, Itzykson Zuber, Quantum Field Theory, McGraw-Hill
Scientific Principle
Spontaneous symmetry breaking

Examples of symmetry breaking of interaction of electromagnetic field and solid state;
spin waves excitation of ferromagnet (Nambu-Goldstone theorem),
superconductivity, plasmon of noble metal and ionized gas of plasma
(Anderson-Kibble-Higgs theorem)

Anderson-Kibble-Higgs theorem
Mass acquiring mechanism by quantum excitation of solid state based on symmetry Breaking of interaction of electromagnetic field and solid state

Reference
Author, Itzykson Zuber, Quantum Field Theory, McGraw-Hill
Author, Yoichiro Nambu, Broken Symmetry, Selected Paper of Yoichiro Nambu
World Scientific,
Example of spontaneous symmetry breaking
(ferromagnet) macroscopic quantum effect of electron spin

Spin rotations are random

Spin rotations tend to directed

Spin rotations to be aligned
Energy of magnetic resonance

Energy of magnetic resonance of microwaves irradiation to magnetic fluid by applying strong magnetic field

\[ P = f \Delta U = \mu_0 \pi \chi'' f H_0^2 \]
\[ \chi'' = \frac{\omega \tau}{1 + (\omega \tau)^2} \chi''_0 \]
\[ \frac{1}{\tau} = \frac{1}{\tau_B} + \frac{1}{\tau_N} \]

(\(\omega = 2\pi f\))

\(P\); energy of magnetic resonance  \(f\); electric field frequency  \(\Delta U\); increase of internal energy
\(\mu_0\); permeability of vacuum  \(\pi\); circular constant  \(\chi''\); complex permeability of magnetic fluid  \(\chi_0\); susceptibility of magnetic fluid  \(\tau\); relaxation time of magnetic fluid  \(\tau_B, \tau_N\); Neel relaxation time
\(H_0\); applying magnetic field
Plasma Energy

Plasma Energy of Ar gas when microwaves are irradiated and strong magnetic field is applied

- When we irradiate microwaves to Ar gas applying strong magnetic field, not only flat direction electric field but also left circular and right circular electric field to the direction of the magnetic field are induced.

\[ W_1 = n_0 \frac{e^2 v_e}{2 m_e} \left( \frac{E_{+z}}{v_a^2} + \frac{E_{-z}}{4 \omega^2 + v_a^2} \right) \]

$W_1$; plasma energy $n_0$; plasma density $e$; electric charge $m_e$; mass of electron $E$; applying microwave electric field $v_e$; elastic collision frequency $\omega$; microwave frequency $\omega = eB_0 / m_e$; electron cyclotron frequency applying magnetic field $B_0$; applying magnetic field $E_+; right$ circular electric field direct to magnetic field $E_-; left$ circular electric field direct to magnetic field $E_z; flat$ electric field

An enhancement of the electric field of magneto-plasmon in which microwaves are irradiated to noble metal applying magnetic field by permanent magnet is following.

\[ E = \frac{m}{q} \omega_p^2 + \frac{q}{m} B_G^2 \]

A plasmon energy is following equation.

\[ W_2 = \frac{\varepsilon_0}{2} E^2 \]

$W_2$; plasmon energy $E$; electric field of plasmon $m$; mass of electron $\omega_p$; plasmon frequency, $B_G$; magnetic field
Quantum Energy Effect

- The quantum interaction energy of the magnetic resonance energy of magnetic fluid spins and electric field of plasma and plasmon energy is following

$$W_3 = (E_+ + E_- + E_z + E) \times n \gamma \hbar B \cdot S$$

- $W_3$; magnetic field energy of interaction $E_+$; right circular electric field direct to magnetic field $E_-$; left circular electric field direct to magnetic field $E_z$; flat electric field of plasma $E$; electric field of plasmon $n$; number of spins $\gamma$; gyromagnetic constant $\hbar$; planck constant $B$; magnetic field of magnetic fluid spins $S$; electron spins

- The total energy is following

$$W = P + (W_1 + W_2 + W_3)$$

- $W$; total energy $P$; magnetic resonance energy $W_1$; plasma energy of Ar gas $W_2$; plasmon energy of noble metal $W_3$; Energy of interaction
Electric Power Capacity

- Mn-Zn ferrite Magnetic fluid 1000kg
- Microwave power 1kW
- Ar gas, Noble metal
  30kW output electric power
- Permanent Magnet 4000 gauss (calculated)

- Volume $50 \times 50 \times 50$cm magnetic fluid + $\alpha$
- 30kW output electric power (calculated)
Application of magnetic fluid generator

Small ad large motor of ship (without oil supply)
Motor of train and tube (without electric line)
Motor of Electric vehicle
Solution of Kyoto protocol
Designing Test facility using microwave oven

We made test facility on 17 July 2012
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