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Research Article

Pico-sized Water Information Transfers and Changes Substance Property

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Abstract

We take care of the water daily life, but people are no worried about in daily life. There is a few of research on the water as basic science. We study the fundamental theme in water, not H_2O itself, which is the item that many people focus on it. Water forms a cluster of five or more with hydrogen bonds. However, we are perspective what happens if we dissociate the bonding. We find two points: a particle and wave in quantum physics of the water after dissociating hydrogen bonds. As a result, the water's information transfers through space and affects other substances. Then, we employ some equipment to elucidate the characteristics indirectly since we cannot directly observe not only H_2O itself but also the hydrogen bond-dissociated particle with instruments. So, we use the research with optical, electricity, and magnetics associated with nuclear magnetic resonance, superconducting quantum interference, far-infrared optical spectroscopy, and laser flash.

We find to understand macroscopic water properties from pico-sized water analysis.

Introduction

Although water we use in daily life insists on several molecules connected with hydrogen bonding, the basic sciences of water are not entirely understood.

However, they have not researched the quantum dynamics of water after hydrogen-bond dissociation so far. Many studies of water relate to bonding with its another chemical compounds in organic chemistry. Mishima and Stanley have discussed crystal structure, density, and structure of water at various pressures have been discussed by [1] and Elington and Dehencedetti [2]. They reported that water becomes more disordered when compressed and those directional attractions (hydrogen bonds) combine with short-range repulsions to determine the relative orientation of neighboring molecules. Novoa et al. showed that H_3O^{2-} and H_3O^+ are involved in a proton-transfer mechanism with a free energy of 0.23×10^{-23} to 0.48×10^{-23} kJ in the THz region [3], and the researches for THz region have increased [4, 5].

We focus on the hydrogen bond-dissociated water supposed to possess elementary particle-like matter after high pressure of 2~3MPa, which we call MICA (Minimal Catalyst) water at the dawn of the water research [6]. We developed higher pressure than 100 MPa to water after that. I define the matter in the water described as $<H^+\sim e^->$, in which the proton and the electron exist neither separately nor form a hydrogen atom. We call this quantum state the extended particle, and it SIGNwater (Spin Information Network) [7, 8]. Moreover, the particle exists for an extended period and shows chemical reduction associated with the electron of nucleus outside and nucleus itself.

Experimental Methods

For our purpose of judging SIGN water when compared with normal water, we only have indirect methods as we can't observe H_2O much more <H^+~e^->; namely, H-NMR (Hydrogen-Nuclear Magnetic Resonance), FT-IR (Fourier Transfer-Infra-red spectroscopy) which we usually employ. Besides them, we ask the researchers to measure magnetic properties, SQUID (Superconducting Quantum Interference Device;0~50kOe), and terahertz measurement (0.6~20 THz). And we also use thermal conductivity for ceramics and Gamma SCOUT (radioactivity measurement), We use computer simulation of DV-Xα molecular orbital method to calculate nitrogen energy level [9, 10, 11]. And thermal conductivity is measured with thermal conductivity measurement equipment with the four-probe method (ZEM-3).

Results and Discussion

Theoretical perspective

$$i\hbar\frac{\partial}{\partial t}\psi(r,t) = H\psi(r,t)$$

Regarding information transfer, the wave comes to mind first. We found the infoton wave function involves the terms of transverse and longitudinal waves [12]; namely,

$$\boldsymbol{H} = \int \phi^{*}\left[\omega \cdot (i\hbar\, c\, \alpha \mathrm{grad} + e\,\mathbf{A})\,\phi - mc^2\beta\,\phi\right]d\tau$$

$$+ \int[2\pi c^2 \mathbf{p}^2 + \frac{1}{8\pi}(\mathrm{curl}\,\mathbf{A})^2]d\tau + \frac{1}{2}\iint \frac{\rho(r,t)\rho(r',t')}{|r-r'|}d\tau d\tau'$$

The first term relates to the plane wave describing electron and electromagnetic potential.

α and β associate with the particle spins. The two terms (vector, P and A) in the second involve a transverse wave indicating the particle's momentum and rotation, and the final one shows a longitudinal wave with Coulomb energy, and ρ(r,t) of a charge distribution. The meaning of the equation is in accord with the experimental evidence that infoton emits far-infrared and terahertz of long-wave length electromagnetic waves.

Essential aspects of the electromagnetic properties of water and other

Since we introduce SIGN water previously [13], here we notice three essential points relating to this article; 1) the water involves the extended particle, infoton, <H^+~e^-> which is not hydrogen atom nor separated ion, 2) infoton emits the long wavelength of far-IR and terahertz, and 3) providing the infoton's properties to other substance as information. Therefore, the infoton functions to a substance and the field as an electromagnetic wave and a particle, and we don't treat H_2O as a molecule. Here is other interesting macroscopical evidence, experiment in the dynamics of the floating water bridge between two beakers (100mL). They applied the high voltage of 15 kV for 50 seconds, then the water flies a beaker to another one. We analyzed that physical parameter was gravity because the energy is not enough to dissociate hydrogen bonds [14, 15, 16].

Measurement and perspective

NMR spectroscopical analysis

We use NMR spectroscopy (JNM-ECA 600 MHz; JEOL Ltd., Tokyo) to record the shape of the spectrum and the energy shift. The external magnetic field applied was 14 Tesla (14×10^4 Gauss).

We observe resonance frequency (of the order of kHz) in ^{1}H, ^{13}C, and ^{15}N on each sample. For example, the 1H nucleus can absorb at 600 MHz and ^{15}N absorbs at 60 MHz under the equation;

$$2\pi v_N = \gamma_N H_0$$

Where, v_N: inherent resonance frequency of nucleus, γ_N: gyromagnetic ratio. H_0: external magnetic field.

In NMR analysis, the nuclear spins of ^{1}H in H_2O (^{15}N in nitrogen compounds) change depending on the external magnetic field to present a particular energy difference between the up and the down spin. The spins in the hydrogen atom can resonate with externally applied radio-magnetic wave energy, depending on the energy difference (nuclear magnetic resonance). The NMR spectra are shown in Fig.1. The half-width (HW) curves indicate the width of the water molecule's spectrum, showing that postulate that MICA water is more active than the control. Furthermore, we can measure a relaxation time of T_2 (spin-lattice relaxation time), and we obtain the half-width value from the following equation;

$$T_2 = 1/(\pi \cdot \Delta v),\ \Delta v = half - width,\ Hz$$

The larger the value of T_2, the narrower the spectrum width (Δv). The value of T_2 for the control and MICA samples were 0.016 s and 0.035 s, respectively. We have therefore shown that molecules of MICA water move more freely due to the presence of smaller clusters because of breaking hydrogen bonds.

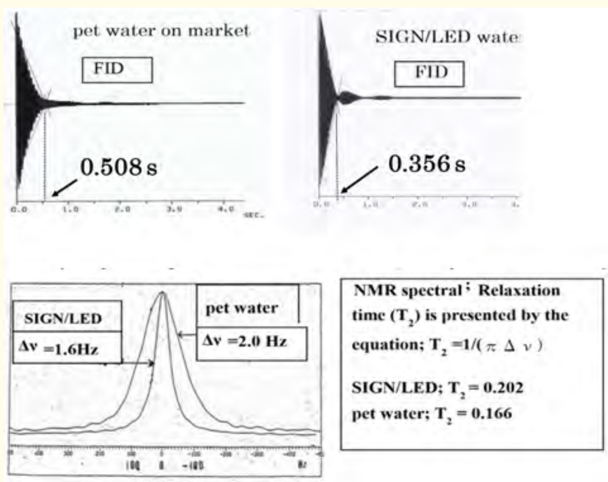

Figure 1: NMR spectroscopy; upper: Free Induction Decay (FID). Lower: relaxation time (T2).

Another NMR analysis with activated glycine

Glycine is the simplest amino acid, $CH_2(NH_2)$ COOH, and exists as dipolar ions; namely, $^{+}NH_3$-CH_2-COO^{-}.

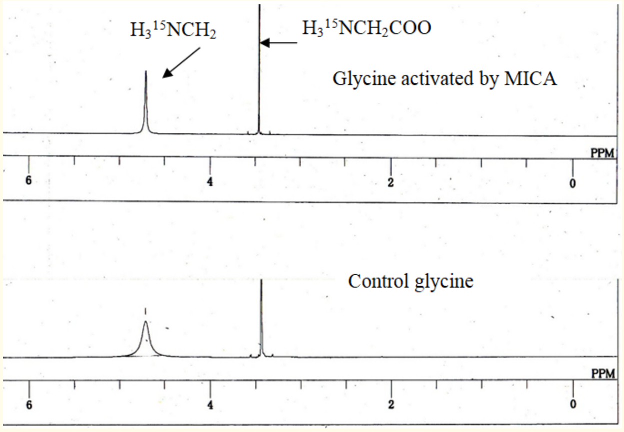

Figure 2: NMR of glycine showing before and after treating with MICA water.

Interestingly, glycine is a substance for inhibitory neuro-transmitter. We can judge a half-width of the peak to calculate the relaxation time of T_2 as water. According to the NMR result, the hydrogen in glycine may activate by infoton with MICA treatment.

FT-IR spectroscopy

Pilluso A. et. al. analyzed Transmittance Fourier-transform infrared spectra of liquid water in the mid-infrared region [17] in which they reported temperature dependence and structural analysis. This region is high energy level at hydroxyl and hydronium ions. Other researches are THz wave propagates on a metal sheet [18], and they have employed THz to analyze the industrial materials [19].

Furthermore, lower energy level of terahertz time-domain spectroscopy has been applied to far-infrared phonon–polariton dispersion study [20].

We employ the FT-IR instrument to confirm whether the water becomes activated one or not. Therefore, we can apply to judge an activated substance by activated with SIGN water.

According to their opinions who use MICA and SIGN water, the activated foods become mild taste and meat softer.

THz measurement

There is the organic compound in the intra-protein proton transfer [21] and THz wave may transmit in activated water more than ordinary water, as shown in FT-IR. This instrument is one applicable device to confirm whether the water becomes to be activated or not, but there are few facilities to equip it. The following shows remarkably more transmittance of the activated sample in the green color curve.

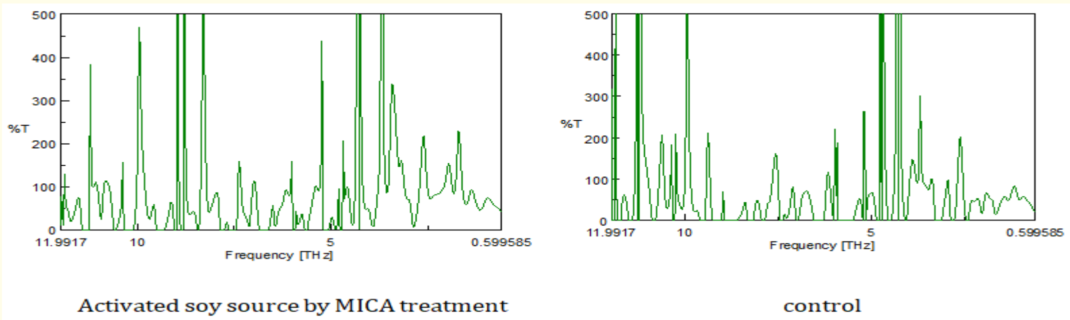

Figure 3: FT-IR spectroscopy; vertical value indicates relative transparency and the abscissa shows 0.6~12 THz. An activated soy source can transfer terahertz wave meaning smaller particles of soy source containing MICA water.

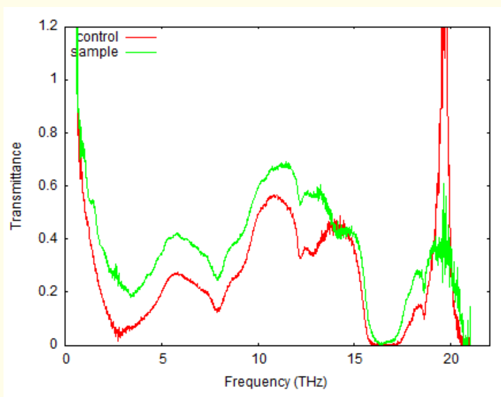

Figure 4: Terahertz spectroscopy for control. Terahertz wave can transmit SIGN water more than control. Vertical indicates an arbitrary transmittance.

M-H measurement results (Magnetic Hysteresis) ---- SQUID
Magnetic properties of glass energized by MICA energy

The SQUID can detect a small magnetic field of 10^{-8} to 10^{-9} times the average strength of the geomagnetic field at the temperature of liquid helium [22]. By the way, the magnetic field strength was on the mountain in Japan 3~5×10^{-5} T; height; 1424m, 35˚41´58´´at north, 138˚04´01´´at east. They must employ an activated glass with the processed water (MICA water) since they cannot estimate water itself at this temperature. They operate the equipment at the external magnetism up to 50 kOe (5 T), and illustrate the magnetization (emu) along with the field in the form of the H–M curve, which shows the magnetic hysteresis.

The common borosilicate glass (diamagnetic)is activated by MICA and the treated sample is compared with an untreated control. The atoms in the glass are affected at a very low level in high external magnetic fields of up to 50 kOe (5 Tesla). We show the results shown in Fig. 5. On the first treatment, it appeared to be magnetized, but no hysteresis appeared on the second occasion. However, this phenomenon was opposite to the result for MICA glass, where the glass showed no magnetization on the first exposure to a magnetic field and a large magnetization on the second exposure.

Figure 5. describes an interesting result. We believe that MICA glass has a specific energy that cancels low magnetization in the first measurement (MICA No.1) because the electron spinning with a certain energy in the MICA glass resonate with the external magnetic field. A more significant magnetization appears in the second measurement (MICA No.2). Furthermore, magnetic moment due to spin increases, resulting in paramagnetic (+~10^{-6} emu) when the magnetic field goes down.

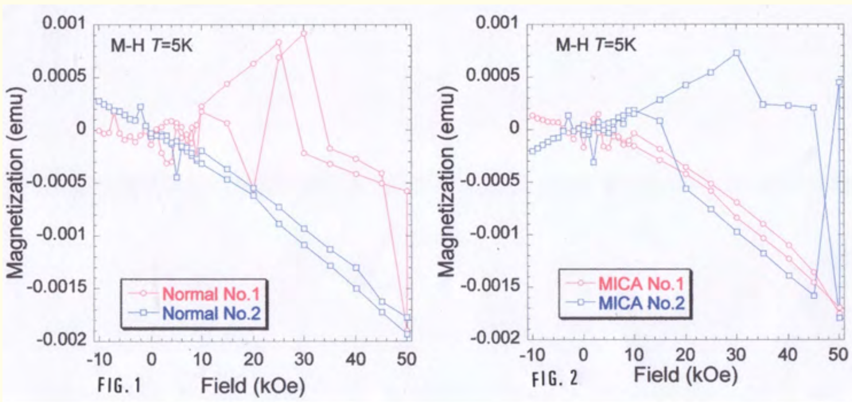

Figure 5: Magnetic hysteresis of the glass with normal and activation, emu; electromagnetic unit (A/m).

Infoton might hold diamagnetic closing to the human body (brain) said to be 10^{-12} T. We confirmed that the indicator of electromagnetic field meter (EMF-825---Mother Tool) moves a minimal amount.

The deodorization with activated LED lights

LED lights (white) include fluorescent paints inside tubes to form white, yellow, and red LED lamps. The paints and glass tube may activate with MICA water.

The activated light from the LED lamps deodorizes a room. Here, we experienced the track painting factory rooms with control lamps and activated ones (Fig 6).

Paints contain organic solvents of toluene and xylene mainly. So, deodorization C-C bonding energy to CH_3 radical is 3.6 eV, and the energy of C-H bonding is 4.3 eV.

Firstly, the CH_3 radical dissociates from the benzene ring, then the C-C bond there dissociates by the activated LED lights. We can see the difference between the number of LED lights (room A and room B).

	LED	before* normal	after* activated LED	reduction rate
Room (A)	40	413	258	−37.5
Room(B)	30	473	379	−19.9

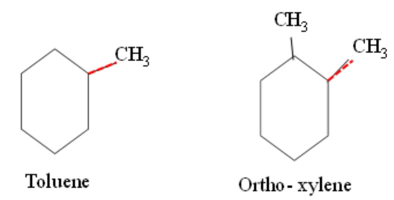

Figure 6: Deodorizing track painting factory room with LED lights. Before and after changing LED lights. Reduction rate; %. Two major organic compounds in the paint are toluene and xylene.

Thermal conductivity

Infoton can keep heat in the thermoelectric semiconducting device. That is why thermal conductivity is the lowest as compared with other compounds. A thermoelectric device ($FeSi_2$) mixes with the Li_2O_3, but only three wt. % is activated with SIGN water than other content materials, as shown in Fig. 7.

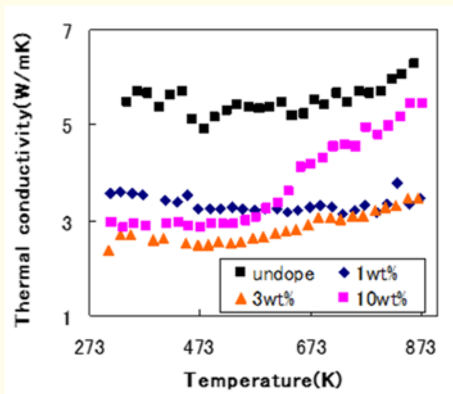

Figure 7: Effects on thermal conductivity of $FeSi_2$ by mixing with Li_2O_3 and with the activated device.

We measure thermal conductivity (κ), electrical conductivity (σ), and Seebeck coefficient (α), then calculate the figure of merit (Z) using the following equation;

$$Z = \frac{\alpha^2}{\kappa}\sigma$$

α; Seebeck coefficient, σ; electrical conductivity, κ; thermal conductivity.

Reduction of radioactivity

We may consider the reason why radiation reduces with SIGN water; one is that infoton wave absorbs radiation from radioactive cesium (Figure 8), and the other is that infoton as an elementary particle accesses a nucleus with more momentum obtaining radiation energy of cesium, and reacts with cesium nucleus as we reported since 2013 often. The following seems to be a new perspective;

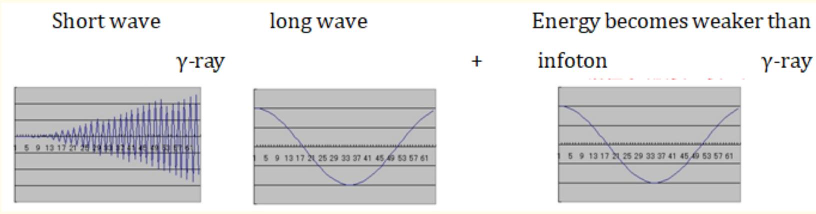

Figure 8: One of the reasons to reduce radioactivity from cesium 134 and 137 processed with SIGN water.

The prolonged electromagnetic wave like infoton of SIGN water absorbs the shorter wave (higher frequency) like γ-ray that cesium emits.

Activation of nitrogen

Previously, Mulliken has reported calculations on the ground state of the nitrogen molecule by Self Consisting Field Molecular Orbital (SCF MO) computation. They used a 20-term basis set of Slater-type functions in which the intern clear distance R from 0.01 atomic unit to the equilibrium distance R_e (= 2.0134 au) in 17 stages distances [27]. Although the scenario is not well understood, we can see new aspects of MICA water as the catalyst through calculations on N_2 activation [28].

Using the total energy spin DV-Xα program, we calculated the total energies of dinitrogen in its activated and no activated states. We consider the spin of the molecule as a function of the length of the N–N bond. These calculations showed that activated nitrogen could exist in stable forms losing energy slowly. Activated nitrogen should emit radiation below the frequency of infrared rays and stabilizes on lowering of the energy. The energy-gap changes from 3 eV to 1.5 eV, corresponding to infrared rays.

Table 1 indicates the energy level change in the highest occupied molecular orbital (HOMO) and the lowest unoccupied molecular orbital (LUMO) corresponding to the N–N distance. As the N–N distance increases, the difference of the potential energy decreases between them; namely, the peripheral lone pair electron in nitrogen moves quickly in the range of 1.6~2.0 Å, closing to the covalent bond strength of nitrogen, N-N.

As a result, nitrogen may be easy to activate by infoton.

Nakamatsu et al. computed N_2 associated withX-ray absorption near edge structure using the DV-Xα method [29], and Tanaka et al. researched to calculate forbidden band structures of N_2N_2 in the vacuum-ultraviolet region [30]. Furthermore, K-shell photon absorption spectra were studied on N_2 molecules [31].

N-N distance (Å)	HOMO	LUMO	HOMO-LUMO
1.0	-4.4	2.3	-6.7
1.5	-4.0	-1.6	-2.4
1.6	-3.7	-1.9	-1.8
2.0	-2.9	-1.5	-1.4

**Note:* HOMO; highest occupied molecular orbital. LUMO; lower unoccupied molecular orbital.

Table 1: N-N distance (Å) vs. energy level (eV) between HOMO* and LUMO*.

Electrical resistivity

SIGN water information may transfer in the electric circuit. It can also progress and give information, even in space.

The peripheral mechanism of acupuncture and moxibustion uses a metal needle at the edge like a Wheatstone bridge. The plasmon frequency is the following;

$$\omega_p^{\,2} \approx n\, e^2/(m^* \varepsilon_\infty) \approx 5\ THz$$

In terms of the electrical resistivity of water, the theoretical maximum value is approximately $1.8 \times 10^5\ \Omega .m$ (at 25 °C), and essential feature of water is its polar nature. We can also measure the dielectric properties of water. Because oxygen has a higher electro negativity than hydrogen, the region of the water molecule containing the oxygen atom carries a partial negative charge. As a result, the dipole generates, resulting in the formation of a hydrogen bond. The hydrogen bond is relatively weak bond compared to the covalent bonds within the water molecule itself. The bond strength is 0.05–0.3 eV, energy close to our body temperature.

Finally, we mention a dielectric property of superconductor (SC) in the SC/TiO_2/SC used as a microwave device at 100~200 K [32].

Conclusion

Our research focuses on the essential properties of the proton and the electron in the hydrogen atom. The pair plays a role in functions as an electromagnetic wave and elementary particle. These results extend to electrical and thermal characteristics. We find new aspects in the viewpoints of macroscopical H_2O according to H-NMR and FT-IR for the spectroscopical perspective. Furthermore, we measure electrical conductivity and Seebeck coefficient by the laser flash method using four-probe and calculate the thermal conductivity of thermoelectric devices from the Seebeck coefficient. SQUID measures magnetic property. We find the activated water becomes magnetic, although it is smaller than the geomagnetic field. Finally, the infoton transfers its information to another substance, even in vacuum and an atmosphere, and the LED light may have infoton details, too.

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Volume 3 Issue 1 July 2022