

<Characteristics and evaluation of Sosei-Sui water>

1. Sosei-Sui: its function as water

Water whether that sits still in clear container or in a lake, or in surging waves can be described as $(\text{H}_2\text{O})_n$, which describes an association of hydrogen bonding. There is deep relation between water and living organisms since all forms of life are comprised of water. Molecular formula, H_2O , is familiar to us all. Yet mankind has not grasped the true nature of water.

Fore mentioned association is a state where two or more molecules bond. The mystery of water lies in the fact that association remains the same in liquid form and solid form when it is ice.

Since water is a natural material, these phenomena will remain constant into the future. However we can enhance the capacity of water by utilizing its characteristics and teaching some lessons to water.

Serendipitously, Fukai has found that water shows new action when it comes in contact with certain mineral ingredients.

As described by H_2O , water is comprised of two hydrogen atoms and one oxygen atom. Further analysis shows, some water contain atoms of differing weights beside the hydrogen and the oxygen atoms. This type of water is called heavy water, whereas we call common water, light water. The difference between the two lies on the hydrogen atom side that bonds with the oxygen. For example, light water's hydrogen atom has one proton but no neutron. Heavy water's hydrogen atom has neutron. This is called isotope since it has twice relative mass.

The water made by Fukai has strengthened joining of hydrogen molecules by letting light water come in contact with variety of mineral ingredients.

One characteristic often discussed about functional water is size of water cluster. It is quite difficult to decrease water cluster, since water is a natural matter. Generally, we have no means of testing whether the cluster is really small or not. So we can not be sure of advertisement that claim to have sized down the water cluster. On the other hand, gustatory sense of

our tongue is sharp enough so that we prepare whiskey-with-water at 2.5 to 1 ratio without being told. ("Cluster New material, Key Technology in Nano Engineering") The whiskey-with-water tastes the best at concentration when mol ratio between alcohol of the whiskey and water is 1:20=4.7% . In this concentration, it is estimated that the number of ethanol slightly exceeds that of water in the water cluster.

Sosei-Sui is said to have small clusters. We have not measured the clusters but from various Sosei-Sui phenomena we can estimate that they are small.

Fukai was able to create (O/W type) Emulsion fuel which derived from his work in water. This was possible probably due to many holes that Sosei-Sui has. (hole theory, Toledo's Rule) It is well known that the smaller the cluster of water, there are more holes. Therefore it is significant to include minimizing water clusters in the definition of functional water.

Molecules in water continuously bond and dissociate in unsteady manner. Using X-ray diffraction, we can see the distribution of the molecules, and their broad distances. Using infrared oscillation spectrum, we can see the changes in water molecule bonding. These are the 'movement' and 'form' of water cluster itself. We observed Sosei-Sui using these apparatus and found that there are more molecules that freely rotate and translate than in other water, although it still truly retains characteristics of water. It is inferred these molecules bond hydrogen in a unique way. Sosei-Sui has shown different values relative to environment's temperature with common water. Generally, 'translation, rotation, and oscillation' are the deciding factors of liquid temperature. In normal temperature, oscillation of molecules that do not oscillate much is the deciding factor. These all relate to working of clusters. That is why water cluster is a contributing factor in forming characteristics of water.

In another experiment, we mixed Sosei-Sui with alcohol, and Sosei-Sui took in more alcohol than other types of water. When water is mixed with alcohol, there are differences in the total amount at certain alcoholic concentration. (UK, at Faraday Memorial, 1953) Enthalpy theory, which

relates to hydrogen bond and energy oscillation was born out of this phenomenon.

It was discovered that when alcohol (ethanol) is 8-9% of water, mol volume is minimized, and when this concentration is higher, the mol volume increases. It is notable that Sosei-Sui showed a bigger change in mol volume than conventional water, although the difference was small. To prove this, we used NMR and Sosei-Sui did come up with distinctive results.

When making functional water, existence of radicals also becomes relevant. Radicals are commonly called free base. 'Free radicals' is a word that is now commonly used. Radicals are generated by applying large Megahertz ultrasonic wave to water. We also know that radicals enhance water's washing power. Solvent gas plays a role in enhancing the activity of H and OH radicals when water molecules are cut off. In Sosei-Sui there are more solvent hydrogen, so washing power is naturally greater. There are some cleaning water that is manufactured by applying ultrasonic wave to common water with solvent hydrogen gas (1.3-2.0ppm)

One of the factors why Sosei-Sui is valued as functional water is its low oxidized reduction electrode. Oxidization usually leads to material deterioration. Scientifically, oxidation and reduction make a pair in principle. The rule is that oxidation entails reduction without exception. The phenomenon is an exchange of electrons between two materials. Oxidation and reduction are continuously occurring within living organisms.

One of the principles of water is that it must be drinkable. Even if water possesses potential characteristics, it is not valued, if it is not potable. Ionized water and ultra-dissociated water occupy significant places in structural research but they are not drinkable.

Sosei-Sui is drinkable and its oxidation-reduction electrode is low, thus does not generate excess active oxygen in human body (OH).

Superoxide anion, as its name shows, are enzymes that are reactive. These are many kinds including super-oxide (O_2^-). It is desirable not to

generate toxic substances such as cellular mitochondria in our body

Oxidation-reduction electrode of superoxide anion is quite large. The larger its positive value, bigger the oxidation power. The larger its negative value, the larger the potential to pull back from oxidation. Metal becomes fragile with rust and eventually rot. If we apply this to human body, we are prone to fall ill when large amount of superoxide anion is generated in the body. Superoxide anion is called the source of all illness. Some enzymes that are inhaled through breathing turn into superoxide anions, which usually help to prevent infectious diseases. When superoxide anions are excessively created, they bond with unsaturated fatty acid and turn into lipid peroxide, which is extreme toxic.

One way to prevent excess generation to superoxide anion is to dip living organism in water with low oxidation-reduction electrode. Crystal clear water in a lake is not a pure water. As old proverb says, 'Fish can not survive in clear water.' Ultra-pure water is drinkable but it is poor water and usually there are only four or five microorganisms per 100cm. On the other hand, natural water contains large amount of metallic ions and is healthy. Sosei-Sui is made from natural water.

Fukai extracted hydrogen from this water which he made.

There is low concentration of hydrogen ions dissolved in water. (hydrogen ion= H^+ proton) Combustion theory explaining the huge combustion of (O/W type) emulsion fuel invented by Fukai does not clearly explain the position of hydrogen in water. There are not many reports on what actions water has during combustion in (O/W type) and (W/O type). However, in O/W type, the action of water is greater than in W/O type.

As molecular formula of water H_2O shows, hydrogen exists in water but technology to extract hydrogen from water is not widely available. On earth, relatively high ratio of hydrogen exists in water. But it is difficult to extract hydrogen whereas methane, a hydrogen compound, is easily extracted. Fukai extracted hydrogen from water and burned it in experimental plant. During combustion, there was no soot at all. This indicates that there was no carbon generated. Hence, black body radiation did not occur and we could not see hydrogen burning with naked eyes.

We assume Fukai was able to extract and burn hydrogen by oscillating chemical binding, chemical framework, of water molecules. Since hydrogen flame has less external energy from radiation than carbonate hydrogen in normal carbonated hydrogen, the temperature is higher compared with other materials. The movie 'Limelight' starring Chaplin shows bright light of gas material (hydrogen) generated by heating raw lime in hydrogen light. In reality, the flame from pure hydrogen is colorless.

2. The Results of Infrared absorption spectrum, Raman scattering, NMR, X-ray diffusion, Neutron scattering

Cluster in water changes its form not just when water is frozen to ice but continue to change through water molecule movement. So there is continuous dissociation and clustering in cluster group of water molecule.

Infrared oscillation spectrum can be used to see the change of distribution of water molecule bonding at normal temperature. On liquid surface, the ones with short waves are prone to absorption.

Infrared spectroscopy uses infrared rays of 2.5-25 (4,000-400cm⁻¹). Absorption spectrum, described by these values, originates from molecular oscillation which accompany dipole moment changes of water molecules.

Infrared oscillation spectrum shows the changes of distribution of water molecule bonding.

Water molecule is peculiar in form. It is difficult to describe them by just showing the results from these apparatus.

However water molecules can be represented by these series of graphs with horizontal and vertical axes. In the reference graph, horizontal axis shows wave numbers or wave length and vertical axis shows penetration ratio and absorption.

Infrared ray is commonly called heat ray. It is invisible ray with wave length of 0.8 -1,000 μm. Since it lies outside of red light, it is called infrared ray. There are near infrared ray with short waves and far infrared ray with long waves. In material such as water, not all the molecules are bonded with hydrogen. There are some molecule groups that rotate and translate, and other groups in which few molecules form a group and freely move about. Then there is another group in which more than a few molecules form a stable loop and bind with hydrogen. In this group there are multiple

molecules. They look as though they are just one big molecule. Then there are groups comprised of dozens of molecules which have bonded with hydrogen. Water is nondescriptive substance.

Since molecular interaction is large, water does not change much even if there is external interference. This is supported by the fact that water can increase its volume in the liquid form but also become absolutely unstable in another form, as in steam. In other words, its energy as form is maintained even in solid or gas form. It is a well known fact that water's heat of fusion and gas heat are higher than other similar liquids. As water is cooled to lower temperature, its density increases and maximizes at 3.98C. Then the density again decreases from 4C to 0C, which is the melting point. That causes ice to float in water, a phenomenon not possible with other materials.

Another way to look at characteristics of water is to use x-ray diffusion. X-ray is also called Roentgen. There are fluorescent x-ray with single energy spectrum and continuous x-ray with continuous energy spectrum. X-ray's penetration increases with shorter wave length, grasping various forms of material. X-ray diffuses x-ray, electron ray, and radiation. You can find the distance with other adjacent atoms and the number of bondings. A.H.Narten,(1971) who is famous for his research of water structure, reports that through x-ray analysis he has found that water retains similar form in liquid as in ice through its molecular binding of hydrogen. Water changes itself according to the environment from which you take the water, but basically keeps regular tetrahedral structure.

Another method you can use is neutron scattering. Since neutron has wave movement, you can identify the water form from neutron scattering when neutrons enter the water.

This is measured by neutron spectrometer. One methodology is crystal spectrometry, which uses the same principle as x-ray diffraction. The other is to measure the duration neutrons fly in the water. Both are very specialized measuring methods.

With all the above mentioned analysis, Sosei-Sui has shown unique performance, and yet retained characteristics of common water. Let me

summarize these unique performances:

- 1.) Using infrared absorption spectrum and Raman scattering, we obtained different curves for Sosei-Sui and common water in both infrared and Raman spectrum.
- 2.) We compared Sosei-Sui and common water structure using NMR (three types: I,V,D) and found no major difference.
- 3.) We measured self-diffusion coefficient of both types of water and there was minor difference.
- 4.) We compared the structure of both types of water using x-ray diffraction at normal temperature and normal pressure. There was minor difference but we could not interpret it.

II. The identity of Sosei-Sui

Tap water in Japan is regulated by Water Service Law and is potable. Source of intake is rivers. The water quality is stipulated in Ministerial Ordinances under the Law. In order to provide safe drinking water, contaminants from biological sources are eliminated as much as possible. The stipulation requires there be no detection of toxic metals such as cyan ion and mercury.

The law also stipulates the amount of copper, iron, manganese, zinc, arsenic, calcium, and magnesium. It also regulates PH balance. Thus hydrogen ion concentration has to be within the range of 5.8-8.6.

When there was a major heavy oil spill accident, founder of Sosei-sui, Fukai, cleaned major part of contaminated area using only Sosei-sui. Sosei-sui is based on common water, which has cleaning power. But Sosei-sui differs greatly from common water in its enhanced cleaning capability.

Fukai focused on the law of physics: solubility of liquid is related to its dielectric constant. Generally speaking, dielectric constant of water is 78.46, which is almost two times that of glycerin's 42.5. It is far bigger than 2.8 of benzene and more than three times that of acetone's 21. Dielectric constant is generally used to show the decrease in clone power, force that works between two electric charges when they are placed in a material, from

that of vacuum.

Fukai focused on the fact that water's dielectric constant is inherently high.

Sosei-sui's conductivity is 125 μ S/cm. This specific value is due to the fact that efforts were made to increase the water's dielectric constant. It is common to use solvent to dissolve a substance. Solvent has a characteristic to dissolve substance. If you want to make sugar water, you put sugar in water. The water acts as solvent.

Water has a capacity to dissolve anything, even pure gold. In this sense, there are no container that could perpetually contain water.

Fukai cleaned a fabric contaminated by oil using only water. He was able to do so by enhancing solubility of water.

There are two characteristics in water: oxidation and reduction. What are oxidation and reduction reaction in water? Fukai designed oxidation-reduction electrode to be low with his Sosei-sui. This is because it is not preferable for many substances within the body of living organism to be oxidized.

Let me describe how Sosei-sui, which possesses these characteristics, are made from tap water.

Summary of making Sosei-sui

There are groups of water molecules which pulls each other regularly and the ones which move freely. It seems there is a system here that is explained by van der Waals' equation of state. In this state, water ions become large and there is strong acidity on the anode side whereas on the cathode side there is strong alkalinity.

Fukai sought to strengthen this state. He used tourmaline and silicate, which includes boron from metamorphic rock, as a first material. He crystallized these into micro cells and mixed ceramic, which works as inductor. Then using special device, he calcined the mixture at high temperature to obtain infinite electrode potential generated from micro

particles. Infinite electrode potential is generated because ion conductible phases are in constant contact within water molecules.

These groups of substances are estimated to be chemically $3 \{ \text{NaX}_3\text{Al}_6(\text{BO}_3)_3 / \text{Si}_6\text{O}_{18}(\text{OH})_9\text{F}_4 \}$ (chemically analyzed by Nagoya Engineering College on 2006, 12, 4). Law of Electro-Magnetism leads us to think that groups of micro-electrode generates both anode and cathode polars between water molecules. The phenomenon is caused by polar binding from electrode gap of water molecules. So the water's oxidation-reduction potential is set low in order for the ion binding to become big and unbalanced.

Fukai used tourmaline and made water come in contact with tourmaline. He applied the principle that the larger the electromagnetivity, the larger the electron's force pulling each other. When tourmaline's surface comes in touch with water, electrolysis phenomenon in broad sense occurs. This generates large amount of O and H. In order for chemicals to react this way in water, (H₂·O₂)type prevails in water. Generated hydrogen gas extremely lowers oxidation-reduction potential.

Another raw material used is metamorphic rock, which is Ferro magnesium volcanic rock. Chemically, it is silicate which includes large ratio of (SiO), which is half crystal-complete crystal in form. Silicate has an action to strongly bond with oxygen metals (ox anion) which is contained in silicon.

So when silicate is mixed with micro-crystal tourmaline and is calcined at about 1000C, (derivative corundum) can be derived.

This can be described as (aluminum oxide = Al O + Si) When you calcine this material at high temperature, interfacial conductivity occurs on the surface of (ceramic corundum) and electro kinetic phenomenon of water molecules widens the potential difference, thus decreasing oxidation-reduction electrode.

The basics of creating Sosei-sui is derived from the fact each water molecule turns into electron conductors because infinite (electrodes) are generated between water molecules. Within electrode unit exists water as

an ion conductive phase, and on the electron conductive phase lies tourmaline, letting electric charge to migrate forever.

These are (Hydroxylation) reaction of water and relate also to (Cation) phenomenon. Cation phenomenon is such that water has an affinity to high conductivity solvent, so large amount of hydrated ion which acts as +ion was generated. We estimate increased amount of active hydrogen lead protons(H) to easily dissociate within water molecules.

Fukai noticed that infinite electrode was generated on the surface of ceramic corundum, and he expected some results by letting ceramic corundum come in contact with water.

Fukai used obsidian expecting oscillation effect to water molecules because obsidian radiates far infrared rays.