Scientific research into Bio Ceramics

TABLE OF CONTENTS

<u>Section 1</u>

A Prologue

Section 2

What is a "Smart Ceramic"

Commercial Applications for the Industrial use of Bio Ceramics

Marketing in Japan

<u>Section 3</u>

Prof. Isao Matsuzaki (Department of Material Engineering - Shinshu University, Japan)

> <u>Section 4</u> trends in Water Activated by Bio Ceramics

<u>Section 5</u>

Evaluation of the Bactericidal/Bacteriostatic Effects of Bio Ceramics

Report by Dr. Crawford S. Dow Pin D. (Head of Biology & Biological Science — Warwick University, England)

<u>Section 6</u>

Ceramics Function and Test Certificates

<u>Section 7</u>

Résumé of Bio Ceramics Application Tests carried out by Grosvenor House Hotel

SECTION 1 A Prologue

Around 2500 years ago Japanese villagers used to keep their drinking water in a vase made in the style of "straw-rope spiral patterned pottery" or, in the language of Japanese archaeologists, a "Jyomon-Doki". This was a natural practice for the Japanese villagers, but no one knew why the water in these vases made from clay from a certain area of Japan stayed fresh for much longer than vases made from ordinary clay.

Pondering why the clay pots were so effective in improving water, a gentleman called Mr Mori found a piece of a "Jyomon-Doki" vase in the Natural History Museum, working with scientists in the food health fields and using his expertise of ceramics, 25 years later, after many a trial and error at firing and glazing the clay, they found the ideal method to get significant results on water quality and the basis of ceramic water treatment was born.

At this time our current chairman visited the manufacturer in Nagano, Japan. He was taken to a Japanese temple as part of his visit and was amazed by the sight of a large Koi lake. The water was crystal clear and he could see the brightly coloured Koi right across the lake. When he asked why the water was so clear the manufacturer replied it is filtered with Waki Misu (Spring water in Japanese), in fact, these were one form of ceramic 'beds' made up of small spheres. Our chairman bought back various types of ceramic spheres to the UK and from this it was found variations of the ceramic were able to target and improve certain conditions which affect our water.

SECTION 2 What Is This "Smart Ceramic"?

Brief Description of 'Bio Ceramics' and Ceramet

Origin:

This ceramic is made from a clay and pulverized rock which is found and excavated near Ena mountain mid-west of Japanese mainland. Mr S.Mori and Mr T. Fukazawa comprise

- FUF Inc., the proprietor, and
- Ena Ceramic Co. Ltd., the manufacturer of Bio Ceramics.

Their product was the result of over two decades' research and development

Ceramet™

Aquatiere's Ceramet[™] is a unique blend of differing Bio Ceramics combined to target a wider spectrum of problems for water quality improvement. Ceramet[™] radiates with far infrared energy, meaning anything in close contact with Ceramet[™] can benefit from its effects, rather like rays from the sun. The Ceramics in Ceramet[™] have been tested and shown to reduce chlorine and sulphate in water making drinks purer and better tasting, and that plants fed with treated water grow stronger with less need for fertilizers and pesticides.

Our unique blend also controls against bacterial growth, removes trace heavy metals, mineral balances the water and moves the water pH towards the alkaline side of the scale for anti-oxidant, alkaline water.

Bio Ceramics have the special ability to cause oscillations in the far end of the infrared spectrum (5 -50 microns), as well as to resonate the centripetal energy. These subtle energies have the effect of excitation on water molecules. This property of Bio Ceramics is responsible for the remarkable effects which it has on substances treated or placed in close proximity to it. These effects have already been studied in depth, and data produced by scientists monitoring, for instance the growth of vegetables which are irrigated with water which has been treated with Bio Ceramics, has been quite astounding. Bio Ceramics effects also have some great benefits to food manufacture and processing:-

- Organic materials such as meat, fish, fruit, vegetables etc., can be kept fresher for longer periods, if stored in containers equipped with Bio Ceramics, or washed with water which has been in contact with Bio Ceramics. Plates of Bio Ceramics have been incorporated into storage units such as 'cool cabinets' with great success - food may be kept fresher and tastier for longer periods, and the build up of ice precipitation within the refrigeration unit is avoided.
- 2. Bio Ceramics also inhibits the growth of bacteria
- 3. The flavour and colour retention of foods stored in conjunction with Bio Ceramics is greatly improved
- 4. Water, milk and other liquids which have been passed over Bio Ceramics taste fresher and tastier.
- 5. Cooking oils can be used for longer periods if the frying equipment includes a plate of Bio Ceramics the oxidation process is reduced by approximately three times. The oil remains fresher and odour-free for longer, and the rate at which the oil absorbs and transfers heat to the item to be cooked is increased, the result being that food is cooked more quickly evenly and less water loss occurs.
- 6. Food may be cooked with plates or small pieces of inert, reusable Bio Ceramics in the pan or whatever, to improve the flavour of the food; again, cooking time is actually reduced.

- 7. Butane gas which has been passed through tubes lined with Bio Ceramics becomes endowed with energy saving properties. The flame produced from the gas imparts heat more efficiently to a subject, and the gas actually burns more efficiently so that energy is saved in processes such as cooking (cooking time is actually reduced), steam production and sterilization etc., - food tastes better if it has been cooked with the treated gas or in the treated water.
- 8. Trials using Bio Ceramics in the heating systems of large factories have seen a drop in fuel consumption of around 209c - even petroleum which has been passed over Bio Ceramics combusts more efficiently to produce significant improvement in vehicular petrol consumption, i.e. more miles to the gallon and less harmful emissions.
- *g.* Plates of Bio Ceramics built into air conditioning system reduce the staticity of the air, cause heat or cold to be more evenly distributed within the body of air, remove bad odours in the air and promote a nicer atmosphere.
- 10. Various components, specially crafted from Bio Ceramics are being incorporated into an ever increasing range of industrial equipment in Japan - manufacturing and processing systems etc., for the purpose of increasing output and quality, reducing energy consumption and sustaining or prolonging the preservation of the processed material or product.
- 11. Pads, for instance containing Bio Ceramics which are strapped to the backs of sufferers of severe back pain have had beneficial effects.
- 12. Experiments carried out by a test center authorized by the Ministry of Agriculture and Fisheries in Japan have shown that fields of rice irrigated with Bio Ceramics treated water will grow stronger plants which are more resistant to damage from heavy wind and rain, produce greater yields and have a greater resistance to disease without the aid of usual pesticides.
- *13.* Fish which are bred and reared in water which is treated with Bio Ceramics have less stress hence are more resistant to infection.
- 14. Bio Ceramics also seems to have a remarkable 'bacteria destroying' property; a public swimming bath in Japan has installed a Bio Ceramics component in its water recycling system, and subsequent monitoring of the water has shown that the level of bacteria in the water is now around 140 counts per millilitre compared with 52,000, as it had been previously.
- 15. The marketing of Bio Ceramics in Japan has not only been aimed at the industrial sector but also to the consumer, by way of numerous devices which may improve domestic environments such as:- a plate of Bio Ceramics which may be kept in the refrigerator to deodorize and prevent frost build-up in the fridge, and keep food fresher for longer; stirring devices for liquids to improve the taste of tea, coffee, wine, juice and milk etc.; sections of special piping which can be incorporated into domestic plumbing or gas piping etc.
- *16.* Natural fibers which are washed in water treated with Bio Ceramics become softer more pliable and last longer for example, hotel and hospital laundries.

Transcription of a Lecture given at the Forum of Technology Transfer held in Osaka on 26th September 1991

A description of the mechanisms and commercial applications of Far Infrared radiating ceramics

1. INTRODUCTION

The title of this lecture uses the common noun "Far infra-red radiating ceramics". Which we will refer to as Bio Ceramics .

Bio Ceramics is widely used in Industry: for treating (through contact) air and water at low, normal and high temperatures.

Having been interested in Bio Ceramics' effects on air and water, I conducted some physical- chemistry experiments in order to further comprehend this material.

2. APPLICATIONS OF BIO CERAMICS

A. Applications with the air.

(1) Air at low temperatures.

The processing of air at low temperatures with Bio Ceramics can be applied with benefits to all forms of commercial and domestic refrigeration units.

When Bio Ceramics is installed on the inside of a fridge or freezer, the formation of mist is avoided, thus eliminating the formation of frost or Ice.

When Bio Ceramics is installed at the mouth of the air duct of a chilled shelf for instance, it may, again, prevent mist from forming in the air.

(2) Air at normal temperatures.

Bio Ceramics can be installed at the mouth of an air conditioning unit's duct in order to clarify, dry and deodorize the air- *useful for example ln a hotel or a dining room*.

(3) Air at normal and high temperatures.

Bio Ceramics' effect on air at normal or high temperatures may be used to good effect in a rice paddy-dryer: again, if Bio Ceramics is installed at the entrance of an air conditioning duct, or at points where the hot air is generated, the efficiency of the drying mechanism may be improved, effectively Improving fuel consumption.

It is well known that Bio Ceramics utilization in high temperature air processing, and the resulting change in the far infra-red spectrum of the air, can be employed to good effect in Saunas and all forms of central heating.

B. Applications with water.

A. Water at normal temperatures.

Bio Ceramics effects upon water at normal temperatures may be used to good effect in both cooking and swimming pool water circulation - producing effects such as de-chlorination, pH neutralization, decomposition on ammonia, and bacteria control.

Bio Ceramics may be applied to the management of rice fields in order to shorten the first joint

of the rlce stalk thereby improving the wind resistance of the stalk resulting in a more successful yield.

B. Water at high temperatures.

Bio Ceramics can be employed in hot spas and bathrooms to the same end as in water treatment at normal temperatures.

It has been proven that the above mentioned effects of Bio Ceramics are physical, but that they can give rise to biological effects such as the prevention of mould on foods and the prolonging of the freshness of food.

3. EXPERIMENTS

The following experiments were conducted for the purpose of clarifying the performance of Bio Ceramics :-

A. Effect on completely aerated distilled water.

The DO measuring installation in fig 1., and the simultaneous measuring installation of pH and ORP in fig 2., were used in this experiment.



(DO = dissolved oxygen, ORP = oxidation reduction potential)

DO measuring installation

- C. DO Meter
- D: Constant temperature water bath
- E: Bio Ceramlc pellet
- F: Beaker stand
- G: Magnetic stirring devices
- H: Magnetic stirrer



Simultaneous measuring installation

of pH and ORP

- A: ORP Meter
- B: pH Meter
- C: Constant temperature water bath
- D: Bio Ceramic pellet

(fig 2)



Completely aerated distilled water at 27°C, with Bio Ceramics disc introduced. The graph shows the changes in the water's characteristics over a period of time/hours

Test 1 Exposed to Bio Ceramics

When Bio Ceramics is placed In completely aerated distilled water, the pH increases whilst ORP and DO decrease as in fig 3.

Test 2 Covered Bio Ceramics.

When Bio Ceramics is covered by a polyethylene sheet (0.07mm thick) and placed in the completely aerated distilled water, the reactions with respect to pH, ORP and DO are practically the same as with exposed Bio Ceramics. (illustrated by fig 4.)



Completely aerated distilled water at 27°C, with Bio Ceramic disc wrapped n a polyethylene sheet (0.07mm in thickness) introduced. The graph shows the changes in the water's characteristics over a period of time/hours.

Test 2 (fig 4)

B. The effects to the temperature and the freezing point of distilled water.

When the temperature and freezing point of the distilled water were measured by a CA thermocouple and a mV meter (I/40°C precision rate), no change was found when Bio Ceramics was placed in the water.

C. Radiation from Bio Ceramics.

When a Geiger counter {for β , γ and χ rays) was set up over Bio Ceramics 'tablet', it counted the same emissions (about 40 times/minute) as with the 'background' reading.

D. The temperature of the upper (glazed) and lower (body) surfaces of a Bio Ceramics.

The temperatures of the top (coated with Far infra-red ceramic) and the bottom (bare surface) of a piece of Bio Ceramics were compared in room temperature by using the same procedure as the above 2., but no difference was found.

E. The effects of air which had been treated with Bio Ceramics on distilled water.

When the treated air was circulated within the distilled water. the pH, OHP and DO of the water remained unchanged.

4. MECHANICS OF BIO CERAMICS

In order to illustrate the mechanisms of Bio Ceramics, the results of the experiments should be explained. The experiments examined the conditions of pH, DO, ORP and temperature of the water, the surface temperature of Bio Ceramics. and the β , γ and χ ray emissions. Incidentally, it was detected that Bio Ceramics radiates 8-14 micron Far infra-red rays. Understanding the above, the following is a summary of our basic knowledge: -

i. The Far infra-red rays

The frequency of Far infra-red rays are within the frequency area of expansion oscillation or angle-change oscillation, whereby. according to the change in expansion or in angle, the molecules with changeable dipole efficiency resonance absorb the Infra-red rays (with an amplitude and angle increase), producing a high temperature. The Far infra-red rays may not be absorbed into a molecule which is made with two atoms- like O₂ or N₂, while they may be absorbed into a molecule which is composed of three atoms- such as asymmetric expansion oscillation. The heating caused by absorption of Far infra-red rays is called the "heating effect" of Far infra-red rays.

ii. Temperature of a body.

When a body is heated, the expansion oscillation and angle-change oscillation start working more rapidly, and the speed of movement ('flight speed') of the molecules begins to increase. The temperature measured by a thermometer is related to the flight speed' of molecules. A molecule which has absorbed Far infra-red rays works harder with respect to expansion oscillation and angle-change oscillation, but its 'flight speed' does not increase (when the oscillation becomes normal, the 'flight speed' increases, but such an increase of speed does not affect the temperature), therefore the temperature in the thermometer is not affected by the molecule's absorption of Far infra-red rays.

iii. Specficity of oxygen.

Oxygen is normally described as O_2 or O=O, but strictly speaking, it has non-pair electrons which should be described as OxO. Oxygen is paramagnet, and it may be attracted to a magnetic field because of its non-pair electrons. Therefore, oxygen may bond with a single hydrogen atom to produce a molecule like HO₂ or H₂O₂.

Iv. Radiation.

Among the high energy radiation which is released from bodies. the following three types of radiation are related to this experiment:

 β rays (high speed corpuscular radiation which is released from the radioactive element), χ rays and γ rays. (both being electromagnetic waves with short wavelength which is released from the radioactive element...the energy of $\chi > \gamma$ }

In conclusion, the experiments can be explained and the effects of Far Infra-red rays can be Illustrated by the above basic knowledge.

I. Do the effects of Bio Ceramics originate from the surface of the ceramics or from the radiated Far Infra-red rays?:-

Polyethylene sheet may absorb Far infra-red rays. Its absorbing capacity depends on the thickness of each sheet. If Bio Ceramics does not radiate the Far infra-red rays, and its surface which is in contact with water causes an effect, such an effect is not deduced to have been made by the Bio Ceramics covered by the polyethylene sheet. However, such a reaction actually emerged, so this means that the Far Infra-red rays were radiated.

If Bio Ceramics radiates Far infra-red rays and Its surface in contact with water causes an effect, it would be quite possible that such an effect must be different, depending whether It is covered by polyethylene sheet or not. However, the nature of each of the effects witnessed did not differ either with or without the polyethylene sheet. Therefore It can be deduced that the surface itself does not make any reaction; for example, there is no semi-conductive nature. This point was verified by the experiment in which it could not create non-electrolytic galvanizing.

According to the above findings, Bio Ceramic effects on water should be caused by the Far infra- red rays radiated from It.

II. Effects on completely aerated distilled water:-

Based on the findings of this experiment, these effects should be outlined as follows:

- (1) Bio Ceramics radiates Far infra-red rays.
- (2) The Far infra-red rays can be absorbed by H_2O . exciting the molecule. However they are not absorbed into the dissolved O_2 .
- (3) The surface of Bio Ceramics is inert.
- (4) When water absorbs Far infra-red rays, the pH, ORP and DO in the water change.

The effect of Bio Ceramics on the completely aerated distilled water will be considered, based on the information regarding electrode reaction of ORP:-

The liquid water (H₂O) links with hydrogen to produce a network linkage such as (H₂O)n.

Generally. H-O-H linkage is ionized as follows:

$$H_2O = H_+ + OH^-$$
 Kw - 1 x 10⁻¹⁴ (25°C)

The Far infra-red rays may excite (weaken) the O-H linkage. Therefore, when the Far infra-red rays are irradiated into water, besides the dissolved O_2 . the following binding of H by O_2 is made, depending on the wavelength and strength of the Far infra-red rays: -



The pH increases following tits binding.

The generation of HO2 in the Reaction (1) and H_2O_2 in Reaction (2) may lower DO and change ORP as follows:-

ORP in completely aerated distilled water 1s:-	$O2 + 2H_2O + 4e = 4OH^-$	ORP = 0.401 V	(3)
Then, HO2 is generated:-	$O_2 + H^+ + 2e = HO_2$	ORP = 0.13 V	(4)
and ORP decreases This case applies to Bio Ceramics			
On the other hand, when H_2O_2 is generated:	$O_2 + 2H + 2e = H_2O_2$	ORP = 0.682 V	(5)
ORP increases. Bio Ceramics does not generate H ₂ O ₂ .			

The above findings explained the result of experiment regarding pH, ORP and DO as the required conditions.

III. The effect of Bio Ceramics:-

As explained above, Bio Ceramics produces HO₂ by reacting to water. HO₂ may react as follows, to bring e (reduction):- $HO_2 = H^+ + O_2 + e^-$

Also, it may take e {oxidation) through the following reaction:- $HO_2 + e = HO_2 - HO_2 + HO_$

IV. The effects of Bio Ceramics are not related to atomic radiation:-

Radiation can change pH, DO and ORP with respect to water. However, radiation may have very harmful effects to the human body.

In this experiment, the release of nuclear radiation from Bio Ceramics was not detected. This means that this form of radiation is not involved in the effects caused by the examined Bio Ceramics with respect to water, and therefore, there will not be any harmful effects to the human body.

V. No change of temperature was detected in the experiment:-

The result of the experiment was that Bio Ceramics does not affect either the temperature or freezing point of water. Bio Ceramics while absorbing heat from water, may emit Far infra-red rays, and the water molecules absorb these and amplify in oscillation (irrespective of water temperature). The absorbed heat is supplied from outside through the container. Therefore, a change of temperature in water is not detected.

No difference in temperature is detected between the coated and uncoated surfaces of Bio Ceramics. In the air around the 'tablet' however, the water dissolved in it (humidity) is excited in an oscillatory way, however, it was not related to the temperature measured by the thermometer.

VI. No frost or ice is accumulated in the freezer or fridge: -

Actually. the 'usual' excessive frost or ice build-up found in a freezer or fridge is avoided when Bio Ceramics is installed in a refrigeration unit, as exhibited in the above applied examples. In order to understand this phenomenon, the condensation process of steam, which is excited in an oscillatory way, should be considered.

The water molecules which are excited in an oscillatory way, contain more energy than those of ordinary water, although this difference in energy may not be measured by a thermometer. However, in practical effect, they do have a higher temperature than the ordinary water, thus, in order to freeze the excited molecules, a lower temperature than 0°C for ordinary water is required. Namely, it is more difficult for them to become mist (condensation/precipitation) or, subsequently, frost.

VII. The water which was treated with the air which had been passed over Bio Ceramics did not exhibit any change:-

In this experiment, the character of the air was changed by the effects of the Far infra-red rays on its water and carbon monoxide content. However, it was felt that too much water was used as the 'detecting body' for any real change to be noticed. This point should be discussed in the future.

As stated above, In rational explanations of the various results of the experiments, the mechanism of Bio Ceramics through Far infra-red radiation will generate oxidizing bodies and reductive bodies, as well as the effects displayed by water and steam at 'high' temperatures. Finally, the above explanations and inferences are the hypothetical and deductive inferences, so the mechanism of Bio Ceramics will require further research.

(OHP 1)

Bio Ceramics manufactured by Ena Ceramic Co., Ltd. Ceramics with Far infra-red radiation.

The effects of Bio Ceramics in the air at low, normal and high temperature/in the water at normal and high temperature and the resulting contribution to industry.

Physical-chemical experimentation and research for the clarification of the mechanism of Bio Ceramics.

(OHP 2)

Applications of Bio Ceramlcs

<u>Objects</u>	<u>Purooees</u>	<u>Effects</u>
Cold air	Freezer,Fridge Cold showcase	No mist, no frost No mist
Normal air	Hotel diner/lounge	Air cleaning
Normal/Hot air	Rice Paddy dryer	Fuel saving
Hot air	Heater	Heating through infra-red radiation
Normal water	Cooking water Swimming pool	Appropriate de-ch1orination, pH neutralization Ammonia-decomposition, sterilization
	Rice field	Wind damage control, improved yields
Hot water	Bathroom	Same as above for swimming pool

(OHP 3)

Results of experiments

1. Completely aerated distilled water

	(A} Uncoated Bio Ceramics:(B) Bio Ceramics covered by PE:	pH increases/ORP and DO decrease As above
2.	Water temperature and freezing point of distilled water:	Not affected
3.	Radiation (χ , β and γ rays):	Nil
4.	Temperature difference between coated and uncoated sides of Bio Ceramics	'tablet': No difference
5.	Air in circulatory contact with Bio Ceramics through water:	No change in water's pH, ORP or DO

Commercial Applications for the Industrial Use of Bio Ceramics

PEST CONTROL / AGRICULTURE / MEAT FARMING / DAIRY / FISHERIES

- To increase animal / meat / fish productivity, crop yields and disease resistance.
- To make the biological control of Agricultural and other pests more efficient.
- To enhance the flavour of all Meat and Dairy Products.

MOTOR INDUSTRIES

- Induce complete combustion (improve fuel efficiency) hence reduce NOx in the emissions. To make lubricant oil particles smaller and finer.
- BC in the air systems of cars speeds up the de-misting of the windows and to reduce bad odours.

BUILDING CONSTRUCTION

- To make air conditioning systems more efficient- reduce damp and staticity in the air, thus reducing corrosion of metals.
- To make areas for food preparation / processing facilities which produce more flavoursome and durable products.
- To make heated water more temperature stable- e.g. central heating etc.
- To make swimming pool water cleaner / odour free.
- To make living and working environments healthier and more pleasant.

ELECTRICAL INDUSTRIES

- To give refrigeration units more cost efficiency, temperature stability and odour-free qualities.
- To make aid fans / blowers produce fresher air

INDUSTRIAL CLEANING / LAUNDRY

- The preservation of natural fabrics.
- BC reduces the long term damage to the skin sustained by detergents.
- To enhance the effectiveness of detergent powder.

FOOD TRANSPORTATION / SHIPPING / FREIGHT / HAULAGE / STORAGE

- Preservation.
- Reducing tissue damage and flavour / colour loss.
- Powdered substances i.e. talc / flour / sugar etc., do not absorb moisture so quickly and do not 'cake'.

PAPER INDUSTRY

• Lignin (wood), cellulose and other natural fibres and colloids used in paper manufacture become stronger and more flexible.

PHARMACEUTICALS / HEALTH / COSMETICS

- To make water—based pharmaceutical products more effective.
- As a component of deodorants- helps to prevent the smell from amino acid decomposition by actively preventing the growth of the bacteria responsible for breaking down the amino acids into the smelly amines.
- To make cosmetics more effective in their protection of the skin.
- To reduce back-pain / migraine / arthritic pain.
- To maintain the healthy positive charge of the water in the body.
- To reduce bacterial growth in the mouth- gums, teeth, throat etc.
- When used as a component in air conditioning reduces human fatigue, dust mites (which can cause allergies), the staticity and humidity of the air.
- 'Perm solutions' may be neutralized and washed out of the hair more efficiently.

WATER PURIFICATION / SANITATION

- To restore freshness and to enhance the recycling and purification of water.
- Reduces lime scale deposits and bacterial growth in water reserves / cisterns.
- Fish aquaria can be kept fresher and cleaner for longer periods.

BREWERY / BEVERAGE / MINERAL WATER

- To enhance the flavour of water-based drinks.
- The presence of BC may speed up the process of the mellowing and maturing of wines and spirits- wines of mediocre quality are improved.
- Inhibits / prevents the furring up of pipes in breweries / bars etc.
- The head on beer become creamier.
- Coffee and Tea can be brewed without the unsightly scum appearing on the top.

FOOD PROCESSING

- * Processes requiring heat, i.e. boiling, baking, roasting etc., are accelerated so that less energy is required, and the flavour and colour of the food is not destroyed to the usual extent.
- * Treated meat will not shrink so much when cooked- does not lose so much moisture during cooking.
- * Pickling processes are accelerated.
- * Bread and pastry texture is improved.
- * Ice making devices produce tastier, cleaner, odour free and harder ice.
- * Natural colloidal suspensions- flour / water etc. become more flexible and gelatinous.



Bio Ceramics have been shaped and fired in a variety of different forms/components:- including trays, plates, pellets and tubes. Item No.1 is approximately the same size as a one pence piece.

The list of Bio Ceramic users in Japan is increasing day by day, and the following are just some of them:

Aichi Social Insurance Centre (Aichi) Aim 21 Akita Minehamamura Agricultural Coop (Akita) Aoyama Club Aquaresort Luneth Kanazawa Swimming pool (Ishikawa) Aso Byakusui Agricultural Coop Kumamoto) Athena Agua Mates Bekkai Chomin Swimming Pool (Hokkaido) Big Sports Nanano Swimming Pool (Ishikawa) CAC Swimming School Katsutadai Century Sports Swimming Pool (Hiroshima) Cerac Chiba Coop Oyumino tChiba) Chiba Coop Takinoi (Chiba) Chiba Coop Yonkaido (Chiba) Chiyoda Swimming (Tokyo) Daikyo Itoman Spinning Iwaki Daiteru Fish Monger (Tsukiji) Dash Swimming Pool Discovery **Dynamic Swimming Pool** Ebetsu Swimming Pool(Hokkaido) Enva Kindergarten **Esper Rehabilitation Centre** EXAS Fukui Swimming Pool (Fukui) EXAS Ginza Swimming Pool (Tokyo) Fitnesswids Kiren Swimming Pool (Osaka) Fuji Food Corp. Fukui River Purifying Project Team (Fukui) Fukuoka Horticultural Coop (Fukuoka) Fukushima Medical University (Fukushima) Gosen Swimming Pool (Nigata) Greenwood Culture School Hamamatsu Restaurant Association (Shizuoka) Hamano Tsusho (Tokyo) Hasuda Itoman Swimming Pool (Saitama) Hiratoshi Agricultural Coop R&D Dept. (Saitama) Hiroo Club (Tokvo) Hiroshima Laundry Service Association (Hiroshima) Honma-gumi Construction Corp. How Sports Ilcushira Swimming Pool (Furuoka) Ishikawa Insurance Agency (Ishikawa) I—Tech Itoman Kasu Itoman Koriyama (Gunma) Itoman Nihonmatsu Itoman Okegawa Itoman School North Iwase Sangyo Japan Top Food Manufacturer **JSS Swimming Pools** Jyumonji Agricultural Coop (Akita) Kaga Swimming Club (Ishikawa) Kagoshimaken I-ligashimachi Fishery Union (Kagoshima) Kaamagaya Swimming School Kamato Agricultural Coop (Kumamoto) Kawano Coffee Inc. Kerio People Swimming Pool (Nigata) Kitabatake Swim & Health (Osaka) Komatsu Air Base (Ishikawa) Komatsu Seibu Department Store (Komatsu) Korakuen Sports Centre (Tokyo) Koshu Swimming School Kotoumicho Agricultural Coop (Nagasaki) Kumamoto Kaben Hoticulture (Kumamoto) Kumamoto YMCA (Kumamoto)

Kunimi Food Trading Inc. Kyoto NHK Bunka Centre Swimming Pool (Kyoto) Lion Beer Garden Lunesu Kanazawa (Ishikawa) Luminus Amusement Park Restaurant (Ishikawa) Luminus Motorbike Racing Team (Ishikawa) Maizuru Self Defence Force Training Swimming Pool (Kyoto) Matsukei Fish Monger (Tsukiji) Matsuura Agricultural Coop R&D Dept. (Nagasaki) Migami (Shizuoka) Mighty Swimming Pool Mini Stop Super Market Miyazaki Flower (Miyazaki) Mori Food Manufacturers Nagoaka Swimming Pool (Nigata) Nakada Primary School Swimming Pool (Yamagata) New Munhen Restaurant New Okabe Hotel (Shizuoka) New Quick Meat Distributions Nihomura Agricultural Goop (Nigata) Nikkaen Nio Bio Nishikawa Futon Inc. Nissan Motors Nittobo Sports Swimming Pool (Saitama) Nizu Swimming Pool (Nigata) Noto National Aquarium (Ishikawa) Ogata Swimming School Ohga Swimming Pool (Kumamoto) Okizumi Swallow Gymnastic Club Ohmiya Itoman Swimming Pool (Saitama) Okegawa Itoman Swimming Pool (Saitama) Osaka Swimming School Nagayoshi (Osaka) Hwake Sports Centre People Toyosaka Swimming Pool (Nigata) People Yokodai Q-P Mayonnaise Fresh Vegetable Division Saga Yamato Heiya Greenhouse Guild (Saga) Sanakaku Agricultural Coop (Kumamoto) Sanjyo Swimming Pool (Nigata) Sankyo Film Inc. Sapporo Beer Brewery Sasanao (Miyagi) Seisei Swimming Pool (Shizuoka) Senrigaoka Swimming Pool (Osaka) Shimonoseki GYM Centre Swimming Pool (Yamaguchi) Shineimaru (Shizuoka) Shirakawaroei Swimming Pool Shiraoi Choumin Swimming Pool (Hokkaido) Showa Agricultural Coop (Yamagata) Showa Flour Mill Inc. Sports Club AZ Sports Club Dash Swimming Pool (Nigata) Sports Club Korakuen Swimmiing Pool (Nigata) Sports Dome Airs Swimming Pool (Toyama) Suitopia Takabatakemachi Organic Rice Guild (Yamagata) Takehu Swimming Pool (Fukui) Tenmanya Swimming Pool (Hiroshima) Tobu Railway (Tokyo) Tohoku Chemical Tradings Tohoku University Student Restaurant Tokyo Disney Family Restaurant (Chiba) Tokyu Sports Plaza Tomio Fitness Club Swimming Pool (Nara) Tornisho Planning Inc. Toshidacho Health Centre (Nigata) Toyo Suisan Pasta / Noodles Manufacturer Tsuruga Swimming Pool (Fukui) Twinwoods Sport Club Swimming Pool (Kyoto) Uemasujyo Agricultural Coop (Kumamoto)

Uoei Super Store (Niigata) U Swim Plaza Segasaki U Swimming Pool Viten Sports Club Viva Sports Seta Swimming Pool (Shiga) Wako Rice Industries Washington Hotel Chain (Nügata) Yamatomo Fishery Food Industries (Sendai) Yamazaki Bakery Nügata Factory (Nügata) Yanmar Engine Corp. Yashiroda Primary School Swinuning Pool (Nigata) YMCA Kikuna Yokohama Fish Market (Yokohama) Yoshida-minami Primary School Swimming Pool (Nigata) Yunichika Swimming Club Zenshoji Nursery

Additional reports

A report written by Mr Mutsuo Iwamoto of the Food Research Institute of the Japanese Ministry of Agriculture, Forestry and Fisheries,

The report focuses on the effects of micro / subtle energy emitted by fine ceramics on water, and the way that water can then become a catalyst and medium for the conduction of vibrations in the far-end of the infra-red spectrum - he also reaffirms the beneficial effects which this part of the infra-red spectrum emitted by fine ceramics has over fresh vegetables, fruit and other food, and that this field can be employed to prevent certain oxidation, improve combustion, germination, sterilization, deodorizing, repositioning of protein after heating etc.

A report published by "Shokuhin Kogyo", a trade journal for the food-related industries, and written by Mr Yoshitaka Kimura, Deputy Head of the Department of Fine Ceramics Research and Development, Showa Electronics Industry.

The report is entitled <u>"Current and Future Views of the Effect of the Far-end of Infra-red Heating on the Food</u> <u>Industry</u>". Various experiments have shown that a field of Micro Electro-Magnetism at the far-end of the infra-red spectrum is emitted from certain fine ceramics, and that this field allows food, for example, to be heated evenly throughout, hence avoiding outer burning, and the time taken to achieve a certain temperature is reduced; less moisture escapes from the food; there are less drips, shrinking etc., (and fewer vitamins and other proteins are destroyed in the cooking process).

SECTION 4 Trends in water Activated by Bio Ceramics

Trends In Water Activated by Bio Ceramics

When Bio Ceramics is Immersed Intap water, the water Issaid to become tastier. Why Is this so? An index is required with which it's possible to evaluate the water state. As a method of evaluating water, it is possible to formulate an explanation based on the changes of the dynamic structure of water according to nuclear magnetic resonance (NMR) spectroscopy. With this It Is possible to non-destructively examine the condition and structure of the molecules. Further measurement of the trace mineral components as described in the "Introduction" can be carried out.

"What is water?". These authors have explained their thinking with "The dynamic structure of Water" and "The Change in the dynamic structure of water due to very weak energy irradiation from Bio Ceramics".

Therefore in here we will briefly try to explain "the structure of water".

Although the chemical formula of water la represented by H_2O . it cannot exist as the single molecule H_2O . As a result of forces working between the water molecules such aa hydrogen bonding, dynamic groupings called clusters are formed with a minimum of 5 molocules. Professor Hlroshl Arakawa ol Hokkaido University disclosed a theory which could explain the dynamic structure of water using a "5 fold - monomolecular mixed model". In accordance with this theory, the proportion of five fold (5 molecular) water molecules present is large when the temperature is low. These clusters are not unchangeable, and ¢continually form larger groups which then break up. However. according to the ¹⁷O-NMR, the movement of the water molecule clusters Is Increased In water which tastes delicous. in other words, the effect obtained is one which suggests that the proportion of small clusters Is large, From the NMR spectroscopy studies it has been found that the lifetime of such water structures Is exceptionally short, 10^{-12} seconds (1 pico second). The water clusters are not static, and therefore the state is called "a dynamic water structure".

When there Is contained a good balance of calcium and trace minerals as in natural spring water, the hydrogen bonds between the water molecules are broken, the large clusters break up, the water molecules surround the circumference of all the minerals and the water molecular clusters are small compared to the situation with pure water, To put it another way the cleaner the water the larger the water molecule clusters. Whatever the reason, when the molecular clusters are small, the water gives a delicious sensation.

Why is there a better taste when there are small water molecule clusters? Our personnel sensed a taste with the tongue's taste buds (taste cells), and it is thought that the smaller the water molecule clusters, the better they can reach the taste bud sites.

Table	1
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(1) Results of analysis of mineral components in the case of tap water which has been passed through BioCeramica and in the case of tap water which has not been passed			
through Bio	Ceramlca.		
Element.	Tokyo (Bunko-ku)	Water passed through	
	tap water	Bio Ceramics	
Calcium (Ca)	17.5	16.8	
Phosphorus (P)	0.022	0.039	
Magnesium (Mg)	2.07	1.99	
Potassium (K)	2.05	2.08	
Sodium (Na)	11.6	11.6	
Selenium (Se)	N.D	0.085	
Strontium (Si)	8.68	8.29	
Zinc (Zn)	0.321	0.042	\checkmark
Manganese (Mn)	0.005	0.004	
Chromium (Cr)	0.007	0.009	
Iron (Fe)	0.082	0.039	\checkmark
Copper (Cu)	0.022	0.009	\checkmark
Cobalt (Co)	N.D	N.D	
Nickel (Ni)	N.D	N.D	
Molybdenum (Mo)	0.003	0.002	
Mercury (Hg)	N.D	N.D	
Arsenic (As)	0.114	0.127	
Cadmium (Cd)	0.01	0.011	
Lead (Pb)	0.033	N.D	▼
Aluminium (Al)	0.037	0.035	
Units = ppr	m (μg/ml) N.D. below d	etectable limits	

Table 2_____

(2)Results of analysis of mineral components in the case of well water which has been			
passed through BioCeramics and in the case of well water which has not been passed			
through Bio	Ceramics		
Element.	Akita-ken, Ogata-	Water passed through	
	mura well water.	Bio Ceramics	
Calcium (Ca)	8.82	9.21	
Phosphorus (P)	0.918	1.04	
Magnesium (Mg)	3.55	3.68	
Potassium (K)	5.35	5.33	
Sodium (Na)	32.5	33.0	
Selenium (Se)	0.216	0.424	
Strontium (Si)	8.41	8.64	
Zinc (Zn)	0.028	0.044	
Manganese (Mn)	0.003	0.003	
Chromium (Cr)	0.009	0.01	
Iron (Fe)	0.017	0.02	
Copper (Cu)	0.015	0.013	
Cobalt (Co)	0.006	0.008	
Nickel (Ni)	0.004	0.005	
Molybdenum (Mo)	0.003	0.004	
Mercury (Hg)	N.D	N.D	
Arsenic (As)	0.102	0.041	\bullet
Cadmium (Cd)	0.018	0.018	
Lead (Pb)	0.028	0.004	▼
Aluminium (Al)	0.007	0.015	
Units = pp	m (μg/ml) N.D. below d	etectable limits	



A. Trace mineral component analysis (Table 2),

Bio Ceramics has an action which regulates well the balance of the essential minerals and inorganic minerals (Hg, As, Cd, Pb, AI), and there is a transformation to delicious water. A point that should be mentioned is that the selenium is changed to a higher value. Selenium is a vital element for the maintenance of resistance to various diseases, and as a main component of enzymes (glutathione-peroxidase) it maintains normal active oxygen, and also, prevents cell oxidation. When there is the correct selenium content, the danger of cancer is reduced, diseases of the circulatory organ are prevented, there is an improved immune function and a better allergic response, and there is a detoxication action on toxic minerals.

B. Observation of improved Effect by MNR (sic) Spectroscopy, (Figure 2)

The narrowness of the peak of the curve shows that there were few large water molecule clusters. The breaking of the hydrogen bonds between the water molecules causes there to be few such water molecule clusters. The bond breakage itself is caused by the very weak energy irradiated by the ceramic.

C. Measurement of pH, dissolved oxygen content, conductivity, and magnetism with differing flow rates per minute.

1) Measurement conditions

i. Sample Treatment

The sample comprised running water composed of tap water at 3 l/minute, 5 l/minute, 7l/minute, 10l/minute and 15lminute.

ITEM	рН	DISSOLVED	CONDUCTIVITY	MAGNETISM
		OXYGEN		
Untreated Water 5 l/min	7.65	7.45	2.3	No change
Treated Water 3 I/min	7.65	8.55	2.5	No change
Treated Water 5 I/min	7.5	5.4	2.6	No change
Treated Water 7 I/min	7.45	8.55	2.6	No change
Treated Water 10 l/min	7.25	7.7	2.6	No change
Treated Water 15 l/min	7.35	8.45	2.6	No change

ii. Analytical apparatus

Hydrogen ion concentration meter: 0-14 pH, M-8 manufactured by Horiba Seisakusho. Dissolved oxygen meter: 5-20 mg/I, MY-900 Conductivity meter: 1-10 mV, DS-7 Magnetometer: 0-20 K Gauss, Model 3251, Recorder: 20 mV-500 V, WR7500

manufactured by lzima Seisakusho. manufactured by Horiba Seisakusho. manufactured by Yokogawa Denki. manufactured by Graphtech KK.

iii. Paper speed used for the recording.

- (1) pH, dissolved oxygen: 25 mm/min.
- (2) Conductivity, pH: 25 mg/min (sic).
- (3) Magnetism: 5 mm/min.

2. Results for above table

- a) **pH** : A change was seen of about 5% compared to the untreated water.
- **Dissolved oxygen**: A reduction to a minimum of 5.4 mg/l was observed with 5 l/min of b) treated water. Therefore it is thought desirable for the flow rate used to be 7 l/min or more.
- **Conductivity**: The treated water had a conductivity about 13% higher than the c) untreated water.
- Magnetism: There was no difference between the treated water and the untreated d) water.

D. Results of The measurements of the characteristic changes in the Oxidation reduction Potential (ORP) and Dissolved oxygen content (DO) (Figure 3. Table 2),

Through contact with Bio Ceramics, water at ordinary temperature, a measurement was made as to whether the water was subject to an activation (function modification) in "an absence of heat effect", and as a result it was experimentally confirmed that there was such an "an absence of heat effect".

Table 2,

Measured results for the characteristic changes {n oxidation reduction potential fORP1 and the dissolved oxygen CDO).

	ORP	DO
Ultrapure water (milli Q) + BC Miniblack x 5	▼	→
Tap water (Shinagawa-ku, Tokyo) + BC Mlniblack x 5.	▼	→
Bio ceramic treated water + BC Miniblack x 5.	▼	→



E. Measurement of the organic phosphorous and trihalomethanes in agricultural water which has been passed through Bio Ceramics

Table 3Water treated with Bio Ceramics contained little total trihalomethanes.This is thought to be due to the catalytic action of the Bio Ceramics.

Analytical results for untreated water		(Units - mg/l)
Analyzed item	Analytical value	Standard value
Total trihalomethane	0.0697	
Chloroform	0.0071	
Bromodichloromethane	0.0123	
Dibromochloromethane	0.0279	
Bromoform	0.0224	
Organic phosphorous	Less than 0.1	Not detectable

Analytical results for water treated with Bio Ceramics (Units - mg/l)			
Analyzed item	Analytical value	Standard value	
Total trihalomethane	0.0669		
Chloroform	0.0064		
Bromodichloromethane	0.0110		
Dibromochloromethane	0.0254		
Bromoform	0.0241		
Organic phosphorous	Less than 0.1	Not detectable	

Analytical method:

Total trihalomethanes:- Head space gas chromatography. Organic phosphorous:- Water supply test method (absorptiometry) F. Changes in the potassium permanganate consumption before and after Introduction of a TSS Niitsu Swimming Bio Ceramics Activator.



Number of members 1323 1647 2061 2399 2648 2900
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Action and effect on food

1. There are now shown the analytical results for each nutritional component and trace mineral in harvested rice, both for when water which had been passed through Bio Ceramics was used during the rice cultivation, and for when water which had not been passed through Bio Ceramics was used during the rice cultivation

Analytical results for mineral components of harvested rice when the water used during the rice cultivation (Akihikari : brown rice), had and had not been passed through Bio Ceramics			
Element.	Untreated with Bio Ceramics	Treated with Bio Ceramics	
Calcium (Ca)	8.43	10.4	A
Phosphorus (P)	445.0	486.0	
Magnesium (Mg)	16.9	19.9	
Potassium (K)	175.0	204.0	
Sodium (Na)	5.87	6.83	
Selenium (Se)	N.D	0.098	
Strontium (Si)	11.8	25.7	
Zinc (Zn)	1.92	2.25	
Manganese (Mn)	2.95	3.68	
Chromium (Cr)	0.124	0.105	
Iron (Fe)	1.45	1.58	
Copper (Cu)	0.199	0.38	
Cobalt (Co)	0.105	0.095	
Nickel (Ni)	N.D	N.D	
Molybdenum (Mo)	0.19	0.152	
Mercury (Hg)	0.028	N.D	▼
Arsenic (As)	N.D	N.D	
Cadmium (Cd)	0.19	0.20	
Lead (Pb)	N.D	0.247	
Aluminium (Al)	0.066	0.076	
Units - mg% (1 mg	g% - 10 ppm). N.D -Belo	ow the detectable limits	

Analytical results for mineral components of harvested rice when the water used during the rice cultivation (Tohoku No. 127: brown rice), had and had not been passed through BioCeramica.

biocerannea.					
Element.	Untreated with	Treated with			
	Bio Ceramics	Bio Ceramics			
Calcium (Ca)	7.63	9.61			
Phosphorus (P)	452.0	462.0			
Magnesium (Mg)	17.9	19.3			
Potassium (K)	185.0	179.0			
Sodium (Na)	6.17	5.63			
Selenium (Se)	N.D	N.D			
Strontium (Si)	8.88	30.2			
Zinc (Zn)	2.03	2.31			
Manganese (Mn)	3.65	3.36			
Chromium (Cr)	0.09	0.13			
Iron (Fe)	1.39	2.37			
Copper (Cu)	0.42	0.42			
Cobalt (Co)	0.08	0.11			
Nickel (Ni)	N.D	N.D			
Molybdenum (Mo)	0.15	0.19			
Mercury (Hg)	N.D	0.09			
Arsenic (As)	N.D	N.D			
Cadmium (Cd)	0.19	0.20			
Lead (Pb)	N.D	0.24			
Aluminium (Al)	0.13	0.84			
Units - mg% (1 mg	g% - 10 ppm). N.D -Belo	ow the detectable limits			

a. Analytical results for all the nutrient components and trace minerals (Table 4).

In the mineral analysis of harvested rice cultivated with the treated water, there was an increase in all kinds of minerals required for human growth, for example in Ca, Mg, Na, Se, Si, Zu (sic), Mn etc. Selenium was remarkable in particular, (an item described earlier under function modifications). Among the nutritional components, there was no significant difference as regards vitamins but the amino acid composition was significant in the case where the water had been treated.

b. Observations on the shape of starch particles by scanning electron microscopy

Table 4 (2)

Results for the analysis of the mineral components of rice harvested when water had and had not been passed through Bio Ceramics during the rice cultivation

Item	Untreated with Bio Ceramics	Treated with Bio Ceramics	
ENERGY	356 kcal/100g	358 kcal/100g	
WATER CONTENT	13.95%	13.66%	
LIPIDS	3.01%	3.24%	
PROTEINS	7.88%	8.50%	
HYDROCARBONS SUGARS	72.34%	71.88%	
HYDROCARBONS FIBRES	1.36%	1.33%	
ASH	1.46%	1.39%	
VITAMIN B1	0.41 mg/100g	0.29 mg/100g	▼
VITAMIN B2	0.05 mg/100g	0.05 mg/100g	
VITAMIN B ₆	0.19 mg/100g	0.27 mg/100g	
NIACIN	6.98 mg/100g	10.16 mg/100g	
VITAMIN E	2.0 mg/100g	1.8 mg/100g	
PANTOTHENIC ACID	1.36 mg/100g	1.74 mg/100g	

SECTION 5

Evaluation of the Bacteriocidal/Bacteriostatic Effects of BioCeramiea ReJaort by DC. Criiiv1<irrl S. D<>iv f'li.D.

Evaluation of the bactericidal / bacteriostatic effects of Bio Ceramics.

"Bio Ceramic discs"

i. Lawns of E. Coli and Pseudomonas fluorescens on nutrient agar plates at 30°C overnight.

Ceramic disc placed on the agar surface.

No indication of growth inhibition around the ceramic.

Disc relocated on the culture plate - no growth beneath disc. On re-incubation no growth into the cleared area(former disc site).

In addition, the bacterial lawn at the relocation site cleared.

Question
Observation- contact with the disc required for bactericidal action?
- surface "activated" by contact with the ceramic does not permit
growth.
- howlonglasting?
- contact time?

- *2.* Ceramic discs placed within the agar showed no inhibition of growth.
- Ceramic discs (5) placed in small column; 10ml of E Coli Kr2 passed through the column at a flow rate of 1ml per 2 minutes; filtrate collected and analyzed.
 Control culture. 8 E 8 cfu/ml Filtrate: 5 E 7 cfu/ml greater than a log drop in viable count.
 - **Observation** -scanning electron microscopy of the disc surface showed a bacteriologically clean surface i.e. the reduction in viable units was not a consequence of attachment to the disc surface.

30thSeptember, 1994



SECTION 6 Ceramics Function and Test Certificates

CERAMICS REPORT ORDER

ORP (Hydrogenating) Ceramic

Hydrogen Water Ceramic Ball

MPH Alkaline Ceramic Ball

KDF Anti-bacterial Ceramic Ball

Chlorine Removal Calcium Sulfite Ceramic Ball

Scale Inhibition Ceramic Ball

Improved Ions Exchange Ceramic Ball

Maifan Stone Ball

Tourmaline Ceramic Ball

Far Infrared Water Ceramic Balls

ORP CERAMIC BALL

Description

ORP water ceramic ball could produce a large scale of OH-, which makes ORP of the water largely reducing from +200mv to 0mv ~ -200mv and restore PH value to 9.5 around. It produces hydrogen water and alkaline water which helps your body maintain a healthy pH level



Param	eters	Functions
Diameter Appearance Specific Area cm2/g Density g/cm3 Specific Density g/cm3 Bulk Density g/m3 Inner Porosity Rate % Bulk Porosity Rate % Clay Pecentage Compression Strength N Flow Rate m/h Cadmium(Cd) mg/kg Lead(Pb) mg/kg Mercery (Hg) mg/kg Hexavalent Chromium (CrVI) SiO2% Al2O3 % Fe2O3 % CaO %	3~10mm, customized Grey color spherical ball >0.5*10 1.35~1.4 1.3~1.55 0.74~0.78 5% 39% <=2% >=50 10~18 ND 9 ND Negative 0.9 0.11 0.27 0.46 0.02	 Increase PH Max.9.5. Increase hydrogen in water Max.600ppb. Produce OH-, ORP Minus -200mv. Make hydrogen water. Remove chlorine and all kinds of oxidized agents form tap water. Remove harmful metal ions. Turn acidic drinking water into alkali calcium ion water. Remove micro obstacles with diameter less than 50um. Negative potential ceramic ball could remove Fe2O3 effectively, which is easily detected in aged tap water By increasing the PH value, negative potential ceramic ball could reduce the CaCO3 solubility. Provide Zinc and protect water from micro-organism. ORP Ceramic balls could also improve the qualities of clean water by adding necessary for proper human development and health minerals, such as Calcium, Magnesium, Sodium, Potassium and others readily found in many natural mineral waters.

Test Data.

50g ORP ceramic balls was put into 200g water. 1 hour later, the index as below







TEST REPORT

Receipt Date : May.02.2012 Test Date : May.10.2012

278-3, Yongdeok-ri, Hallim-myeon, Gimhae-si, Gyeongsangnam-do, Korea

Sample : Anti-Oxidant Alkaline Hydrogen Reducing Ball(ORP BALL)

Testing Environment : Temperature(22° C ~ 26° C), Relative humidity (55% ~ 65%)

Test method : Refer to following pages

Testing Date : May.03.2012 ~ May.10.2012

Test result : Refer to following pages

Attachment : Flowchart and Sample pictures

USAGE : QUALITY CONTROL

NOTE : 1. The test results on this test report are only limited to the samples and sample names provided by the customer and KTR do not guarantee the quality of all products of the customer.

2. This test report shall not be used for public relation, advertisement, lawsuit and any other purposes outside the scope of its defined usage.

Chang-Min Kang

Prepared by Chang-Min Kang Tel: +82-52-220-3147 E-mail: elp@ktr.or.kr

Sung-Uk Lee

Reviewed by Sung-Uk Lee Technical Manager E-mail: broad@ktr.or.kr

May.10.2012

Korea Testing & Research Institute

President

sung Att



전자문서본(Electronic Copy)

1 of Total

4 Page(s)



YOUR PARTNER FOR THE BEST QUALITY



TEST REPORT

Repot No :	TAU-008300		
Sample :	Anti-Oxidant Alkaline Hydrogen Reducin	Ig Ball(ORP	BALL)

TEST RESULT Test Items Unit Sample Results MDL Test Methods Рb 5 IEC 62321 Ed.1(ICP) _ Not Detected mg/kgCd -Not Detected 1 IEC 62321 Ed.1(ICP) mg/kg IEC 62321 Ed.1(CV-AAS) Нg Not Detected 1 mg/kg Cr6+ Not Detected 1 IEC 62321 Ed.1(UV/Vis) mg/kg

Notes :

N.D. = Not Detected

MDL = Method Detection Limit





YOUR PARTNER FOR THE BEST QUALITY

TEST REPORT

Repot No : TAU-008300 Sample : Anti-Oxidant Alkaline Hydrogen Reducing Ball(ORP BALL)

Pb : Tested by Chang-Min Kang(Tel : 052-220-3147) Cd : Tested by Chang-Min Kang(Tel : 052-220-3147)

Hg: Tested by Chang-Min Kang(Tel: 052-220-3147)

Cr6+: Tested by Chang-Min Kang(Tel: 052-220-3147)

The samples were dissolved totally by pre-conditioning method according to below flow chart.

Flow Chart

Heavy metal analytical FIOW CHART







YOUR PARTNER FOR THE BEST QUALITY

TEST REPORT

Repot No :	TAU-008300					
Sample :	Anti-Oxidant	Alkaline	Hydrogen	Reducing	Ball(ORP	BALL)

Sample Photo





HYDROGEN WATER CERAMIC BALL

Description

Hydrogen water ceramic ball is the second generation of ORP ceramic ball. We add more percentage of hydrogen making material into hydrogen ceramic ball. It could also make alkaline water with PH of 8.5 or so. Parameter of dissolved H+ is about 600~1500 ppb. It has integrated functions of making Kangen water, ORP water, alkaline water and micro molecule water.



It provides the more healthy alkaline water with hydrogen dissolved. It offers absolute mechanical filtration to 0.2 micron with the rejection rate of 99.9% to bacteria and cysts.

Diameter $3\sim10mm, customized$ AppearanceGrey color spherical ballSpecific Area cm2/g>0.5*10Ph $8-10$ H+ $600-1500 ppb$ ORP(mv)-600mvApplicationPotable water filterHousehold waterpurification for Bath & Cosmetic etc.Kornetic etc.Hydrogen ceramic ball generate alkaline water (PH 8.0 or above) which has antimicrobial and resisting bacteria effect.It provides natural hydrogen water through electrolysis and makes micro bubbles.It creates negative redox potential which activates water into smaller molecules.Potable water filter Household waterPurification for Bath & Cosmetic etc.	Pa	rameters	Functions
 It removes hydrogen sulfide in water 	Pa Diameter Appearance Specific Area cm2/g Ph H+ ORP(mv) Application	3~10mm, customized Grey color spherical ball >0.5*10 8-10 600-1500 ppb -600mv Potable water filter Household water purification for Bath & Cosmetic etc.	 Hydrogen ceramic ball generate alkaline water (PH 8.0 or above) which has antimicrobial and resisting bacteria effect. It provides natural hydrogen water through electrolysis and makes micro bubbles. It creates negative redox potential which activates water into smaller molecules. The sufficient minerals and negative ions provide oxygen. Hydrogen ceramic ball could remove metallic pollution and other impurities in the water. It removes hydrogen sulfide in water

• With large amount of negative ions distributing into water, hydrogen ceramic ball could remove chlorine effectively



Test Data 1;

20.69g Hydrogen Water ceramic balls was put into 500g water.						
Items	H+(ppb) PH ORP(mv) TDS(
3 min 0 7.4 20 5						
10mins	690	7.7	-204	15		
30mins	730	7.4	-286	33		
60mins 827 7.5 -321 63						
1080mins	844	10.2	-349	279		
Refer to pure water ORP of 93mv						

20.80g Hydrogen Water ceramic balls was put into 750ml water						
Items	H+(ppb) PH ORP(mv) TDS					
3 min	0	7.4	84	7		
10mins	391	7.3	-68	20		
30mins	676	7.4	-242	38		
60mins 772 8 -331 58						
1080mins	835	10.2	-344	244		
Refer to pure water ORP of 93mv						

Test data 2:

25.10g Hydrogen Water ceramic balls was put into 500ml water							
Items	H+(ppb) PH ORP(mv) TDS(mg/l)						
3 min	0	9.56	46	18			
10mins	300	9.82	37	46			
30mins	520	9.99	-36	75			
60mins	780	10.12	-82	99			
1020mins	1140		-350	339			
Defense must model ODD of 145 mm							

Refer to pure water ORP of 145mv.

25.05g Hydrogen Water ceramic balls was put into 750ml water					
Items	H+(ppb)	PH	ORP	TDS(mg/l)	
3 min	180	9.71	40	23	
10mins	280	9.92	-20	34	
30mins	560	9.99	-35	48	
60mins	680	10.09	-98	74	
1020mins	970		-328	295	
Defente mure water ODD of 145 my					

Refer to pure water ORP of 145mv.

Test data: The following test show composition of Hydrogen Water Ceramic Ball



Tests Conducted Total (Heavy Metal) Content

As per client's recuest, With reference to EPA 6010C acid digestion method was used and total (heavy metal) content was determined by Inductively Coupled Argon Plasma Spectrometry.

Tested element	Result (ppm)			
A	890	Conclusion: Te	est Data shows that Hydrogen	
As	<10	Water Ceramic Ball provides more healthy		
Ba Be	<10 <10	mineral water with hydrogen and offers		
Cd	~5	rejection rate	of 99.9% to bacteria and cysts	
Co	<10	Mg(mg)	6.71	
C	<10	Ca(mg)	4.2	
Cu	<10	Fe(mg)	0.006	
Fe	505	Pa(mg)	<0.0001	
Ma	<10	r a(mg)	<0.0001	
Ma	450	Cr(mg)	<0.0001	
Mo	<10	Na(mg)	0.42	
N	<10	K(mg)	0.51	
Pb	<10	Si(mg)	0.13	
Sb	<10	Sr(mg)	<0.0001	
Se	<10	7 (mg)	<0.0001	
Sn	<10	Zn(mg)	-	
5	35			
T	<10			
V	<10			
Zn	37840			

Remark: ppm = Parts per million = mg/kg





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report &

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Test Report Rep		Report No: AS	SH18-040150	-02	Issue Date: Sep 05 2018		
	Testiteme		Test methods	Test results		Increased	Requirements (Standard for Hygienic Safety Evaluation of
Test	Test items U	Unit(S)	nit(s) Test methods	Extractant water	Control exposure water	amount	Equipment and Protective Materials in Drinking Water)
Vol Phe Comp (as p	latile enolic bounds henol)	mg/L	GB/T 5750.4-2006	< 0.002	< 0.002	<0.002	Increased amount ≪0.002

SAMPLE DESCRIPTION: Hydrogen Ceramic Balls



*** End ***

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t 400 - 691 - 0488 t 400 - 691 - 0488
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 www.sgsgroup.com.cn

 f (86-21) 6140 2547
 e sgs.china@sgs.com

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MPH ALKALINE CERAMIC BALL

Description

Alkaline Ceramic Ball is made of natural Maifan Stone powder and pearl powder and other natural mineral materials by submicron technology. It has features of high efficient, durable and very reliable in making alkaline water. White alkaline ceramic balls have been produced for many years in China. However fast dissolving makes short effective period. In 2015, our research group developed nano structure and more improvements for white alkaline ceramic balls. Our white alkaline balls make alkaline water instantly and effective time could last 1 year.



Alkaline Ball has high efficient could distribute more than 20 kinds of mineral elements, especially sufficient silicic acid (about 60mg/L).

F	Functions	
Diameter	3~10mm, customized	• Restore PH value between 8 and 9.5, make alkaline water.
Appearance	White color spherical ball	• Durable, could use at least 1
Material	Natural Maifan stone, pearl powder	 Neutralize acid water, boiler
PH Value	8~9.5	condensate etc.
Alkaline Water Making	Instantly	Provides more than 20 kinds of nutrient.
Effective Time	1 year	Mineralize your water.



Client Name: Client address :

Sample name: Sample Batch No: Product Date: Manufacturer:

Report No: ASH16-018872-02

Date May 31 2016

Eternal New Material Industrial CO., Ltd Room 425, Tower C, Jiahui Huanqiu Square, No 648 Beiyuan Avenue Tianqiao District, Ji'nan Pearl calcium alkaline ball 20160510 May 12, 2016 Eternal New Material Industrial CO., Ltd

Above information and sample(s) was/were submitted and certified by the client , SGS quoted the information with no responsibility as to the accuracy , adequacy and/or completeness

SGS Sample No.: SGS Reference No.: Date of sample received: Testing period: ASH16-018872.001 SNAPR1610419300 May 18, 2016 May 18, 2016~ May 26, 2016

TEST(S) REQUESTED

Selected test(s) as requested by applicant : immerse sample into 50 times volume exposure to water and maintained in a dark place for $24h \pm 1h$ at a temperature of $25^{\circ}C \pm 5^{\circ}C$. Then the extractant water is collected and analyzed.

TEST METHOD(S): Please refer to next page(s)

TEST RESULT(S):

Please refer to next page(s)

Chinese shall prevail in this report.

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Report No: ASH16-018872-02 Date May 31 2016

TEST METHOD(S):

Hygienic safety extraction testing: Refer to MOH Standard for Hygienic Safety Evaluation of Equipment and Protective Materials in Drinking Water Appendix A Test Method of equipment in Drinking Water

Color, Turbidity, Odor and taste, Visible substance, pH, Volatile phenolic compounds, Total dissolved solids: GB/T5750.4-2006 Standard examination methods for drinking water – Organoleptic and physical parameters,

Oxygen consumption (count with O_2): GB/T5750.7-2006 Standard examination methods for drinking water – Aggregate organic parameters.

Arsenic (As). Cadmium (Cd), Aluminum (Al), Lead (Pb), Mercury (Hg), Iron (Fe), Manganese (Mn), Copper (Cu), Zinc (Zn): GB/T5750.6-2006 Standard examination methods for drinking water – Metal parameters Inductively coupled plasma mass spectrometry.

Chromium-VI : GB/T5750.6-2006 Standard examination methods for drinking water – Metal parameters

Chloroform: GB/T5750.8-2006 Standard examination methods for drinking water – Organic parameters

Test items	Unit(s)	Test Methods	Test R	esults	Increased	Requirements (Standards
			Extractant	Control	Amount	for Hygienic Safety Evaluation of Equipment
			water	water		and Protective Materials
Colour	Pt-Co					
Goldar	Colour units	GB/T5750.4-2006	<5	<5	<5	Increased amount ≤ 5
Turbidity	NTU	GB/T5750.4-2006	<0.2	<0.2	<0.2	Increased amount ≤ 0.2
Odor and Taste		GB/T5750.4-2006	None	None	None	No abnormal odor and taste
Visible substance		GB/T5750.4-2006	None	None	None	Absence
рН		GB/T5750.4-2006	9.43	9.01	0.42	Variation≤ 0.5
Total dissolved solids	mg/L	GB/T5750.4-2006	214	209	5	Increased amount ≤ 10
Oxygen consumpti on (as O ²)	mg/L	GB/T5750.7-2006	0.40	0.40	0	Increased amount ≤ 1

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Page 2 of 4



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Report No: ASH16-018872-02

Date May 31 2016

Test items	Unit(s	Test Methods	Test Re	esults	Increase	Requirements (Standards
)		Extractant	Control	d	for Hygienic Safety
			Water	exposure	Amount	Evaluation of Equipment
				water		and Protective Materials in
						Drinking Water)
Arsnic (As)	mg/L	GB/T5750.6-2006	<0.0005	<0.0005	<0.0005	Increased amount ≤0.001
Cadmium (Cd)	mg/L	GB/T5750.6-2006	<0.0002	<0.0002	<0.0002	Increased amount ≤0.0005
Chromium-IV	mg/L	GB/T5750.6-2006	< 0.004	< 0.004	< 0.004	Increased amount ≤0.005
Aluminum (Al)	mg/L	GB/T5750.6-2006	< 0.010	< 0.010	< 0.010	Increased amount ≤0.02
Lead (Pb)	mg/L	GB/T5750.6-2006	< 0.0005	< 0.0005	< 0.0005	Increased amount ≤0.001
Mercury (Hg)	mg/L	GB/T5750.6-2006	< 0.0002	< 0.0002	< 0.0002	Increased amount ≤0.0002
Iron (Fe)	mg/L	GB/T5750.6-2006	< 0.007	< 0.007	< 0.007	Increased amount ≤0.06
Manganese (Mn)	mg/L	GB/T5750.6-2006	<0.005	<0.005	<0.005	Increased amount ≤0.02
Copper (Cu)	mg/L	GB/T5750.6-2006	< 0.006	< 0.006	< 0.006	Increased amount ≤0.2
Zinc (Zn	mg/L	GB/T5750.6-2006	< 0.002	< 0.002	< 0.002	Increased amount ≤0.02
Chloroform	mg/L	GB/T5750.8-2006	< 0.0023	< 0.0023	0	Increased amount ≤0.006
Volotile						
Phenolic	mg/I	GB/T5750 4-2006	<0.002	<0.002	<0.002	Increased amount < 0.002
Compounds	ше/ L	32/13/30.12000	\$0.002	<0.00Z	×0.002	mer cascu amount 20.002
(as phenol)						

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Mambar of the CCC Group (CCC CA)



Sample Photo :

Report No: ASH16-018872-02

Date May 31 2016



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Mambar of the SCE Group (SCE SA)

KDF ANTI-BACTERIAL CERAMIC BALL

Description

Micro-porous anti-bacterial ceramic balls are composed of zeolite, sepiolite, bentonite, kieselguhr, photocatalysis degradable material and anti-bacterial materials. They are rich of silver ions which are all over micropores' specific area. Silver ions kill bacteria and deter bacterial growth by breaking down organic compounds that comprise bacteria, such as bacterial cell membrane. They can even decompose bacterial remains. Test shows that the inhibition rate achieves to 96% for Escherichia coli and Staphylococcus aureus. Nano titania has excellent performance in absorbing metal ions and releasing negative oxygen



As known to all, KDF are optimal media killing and resisting bacteria. Microporous ceramic balls have reliable and long lasting performance in killing & resisting bacteria and absorption of micro particles and microorganism

	Microporous Ceramic Ball	Silver Ions Ceramic Ball
Appearance	micro poles arranged regularly; release bubles no substance dissolved	solid structure; no bubles, no substance dissolved
Specific Area	500~800cm2 per ball(diameter of 5mm)	0.05~0.06cm2 per ball(diameter of 5mm)
Anti bacteria	SGS Test shows Microporous Balls kill 98% E-colis and 96% Staphylococcus aureus	Unkown
	Humidifier: 30g~50g/L	Humidifier: 80g~100g/L
Using	Purifier: 1kg of Microporous balls into 100tons of tap water	Purifier: 1kg of Microporous balls into 10tons of tap water

Micro porous balls have optimal anti-bacterial performance in comparison to Silver Ions Balls.

In comparison to activated carbon.

	Microporous Ceramic Ball	Activated Carbon
Appearance	micro poles arranged regularly ball; no residue powder;	black powder or particles
Micro pole structure	Micro pole diameter of 0.27~0.98nm; could absorb micro particles and microorganism	only microspores carbon have limited absorption functions
Material	mixed absorbing material with degradable photo catalyst and rare-earth anti-bacterial material	coal, wood, coconuts shell, nuts shell etc
Functions	 filter water and absorb harmful substance; anti-bacteria activated water, make micro-clustered water 	 Remove foul taste from water remove polluted particles and organisms

Par	ameters	Functions		
Diameter	1~8mm,	Microporous antibacterial water Ceramic Balls		
Appearance	Golden yellow spherical ball	 Activated water. Villing and registing collibrations condidated 		
Specific Area (m²/g)	>500	albicans, golden		
Bulk Density (g/m ³)	0.74-0.78	staphylococcus,pseudomonas aeruginosa		
Biosorption of heavy metal	>99%	 100 times enhanced absorbing of heavy 		
Absorption of organisms	>99%	metal ions organisms.		
Anti bacterial function	>96%	• Micro-clustered water hydrate cells more		
Specific Gravity (g/m ³)	1.3-1.55	effectively.Remove smell from water.		
		 Remove pesticide residues from fruits and vegetables. 		
		• Distribute Negative oxygen ion in water.		

Tests

a) Water Activation Test for Microporous anti-bacterial ceramic water ball shows results as below:

Sample	3min	20min	150h
30g/L	87.04Hz	86.79Hz	69.70Hz
50g/L	81.17Hz	84.45Hz	74.79Hz
80g/L	80.35Hz	79.36Hz	66.62Hz

b) Anti-bacterial Test for Microporous anti-bacterial ceramic water ball shows results as below:

	Bacterial colony (cfu)	Potable water (cfu)
Blank control	126	-
Tap water	51	100/ml
Microporous anti-bacterial ceramic ball	7	100/ml



TEST REPORT

No. : SHIN1511050387PS Date : Nov 17, 2015 Page: 1 of 2

CUSTOMER NAME: ETERNAL NEW MATERIAL INDUSTRIAL CO., LTD ADDRESS: ROOM 425,TOWER C,JIAHUI HUANQIU SQUARE,NO.548,BEIYUAN AVENUE, TIANQIAO DISTRICT,JINAN

The following sample(s) was/ were submitted and identified on behalf of the client as:

Sample Name		microporous antibacterial ceramic ball
Product Specification	÷	diameter 2-3mm
Product or Lot No.	:	20151028
Manufacturer	1	Eternal New Material Industrial Co., Ltd.
Date of Receipt	1	Nov 04, 2015
Testing Start Date	:	Nov 04, 2015
Testing End Date	1	Nov 17, 2015
Test result(s)	:	For further details, please refer to the following page(s)

Signed for SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

10h

Cathy Wu Authorized signatory



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TEST REPORT

No. : SHIN1511050387PS

Date : Nov 17, 2015 Page: 2 of 2

Test Item: Determine the antimicrobial activity of the submitted sample in 1 hour

Sample Description: 1 bag ca.530g/bag grain in bag

Test Method: ASTM E2149-2013a Determining the Antimicrobial Activity of Antimicrobial Agents

Under Dynamic Contact Conditions

Test Organism(s): Escherichia coli ATCC 25922

Test Result:

Name of test	The number of I	Reduction		
organism	1	"0"contact time	"1h"contact time	%
Escherichia coli	Inoculum only control	2.8×10⁵	2.8×10⁵	99.2%
ATCC 25922	Sample (10g)	2.8×10⁵	0.2×10 ³	

Remark: The reduction calculations are based on values from inoculum only control.

Sample Photo:



********* End of report*******



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CHLORINE REMOVAL CALCIUM SULFITE CERAMIC BALL

Description

Chlorine Removal Calcium Sulfite Ball is composed of 90% Calcium Sulfite.

It is widely used in swimming pool, shower, bath club, chlorine removing equipment and etc. CaSO₃ ball has optimal performance in removing chlorine, including C10-, HC10, Cl2, and could remove 99% Chlorine in 0.8 seconds.



	Parameters
Diameter	1~10mm,
Appearance	white colour spherical ball
Material	Food Grade CaSO ₃
CaSO ₃ percentage	>=90%
CaSO ₃ dissolution	0.02mg/L
Hardness	high
Density (g/cm ³)	1.35-1.4

Advantages of CaSO3 ceramic balls

- + High efficient, reliable and long lasting performance in removing chlorine
- · remove microscopic particles and microorganisms
- · Food grade material ensures no harmful substance dissolved in water

Test Data:

Substance percentage of 100g Chlorine Removal Calcium Sulfite Ball:

index Item	CaSO3	CaO	SiO2	MgO	Na2O	others
CaSO3 ball	95.1	0.3	1	2.6	0.7	0.3



No. TSNHG1702695901 Date 16 F

Date 16 Feb 2017

Page 1 of 5

JINAN YIQIU TRADING CO., LTD NO 548 BEIYUAN ROAD,JINAN CITY,SHANDONG PROVINCE,CHINA

The following sample(s) was/were submitted and identified on behalf of the clients as : CALCIUM SULPHITE BALL

SGS Job No ;
Model No :
Material No :
Lot No :
Main Substance
Date Sample Received :
Testing Period :
Test Requested :
Test Method :
Test Results :

QDHG1702006028CO -QD AH-FDW-3 AH-FDW-3 AH20170111 CALCIUM SULPHITE CERAMIC POWDER 10 Feb 2017 10 Feb 2017 – 16 Feb 2017 Selected test(s) as requested by client. Please refer to next page(s). Please refer to next page(s).

Conclusion

Based on the performed tests on submitted sample(s) the results of Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBBs) Polybrominated diphenylethers (PBDEs) comply with the limits as set by RoHS Directive 2011/65 EU Annex II: recasting 2002/95/EC

Signed for SGS-CSTC Standards Technical Services (Tianjin) Co., Ltd.

ubora

Reabeca Zhou Approved Signatory



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No. TSNHG1702695901

Date 16 Feb 2017

Page 2 of 5

Test Results :

Test Part Description :

Specimem No.	SGS Sample ID	Description
SN1	TSM17-026959.001	grey grains

Remarks.

- (1) 1 mg/kg = 0.0001%
- (2) MDL = Method detection Limit
- (3) ND =Not Detected (< MDL)
- (4) "-" = Not regulated

RoHS Directive 2011/65/EU

Test Method : (1) With reference to IEC 62321-5:2013. determination of Cadmium by ICP-OES

- (2) With reference to IEC 62321-5:2013. determination of Lead by ICP-OES
- (3) With reference to IEC 62321-5:2013. determination of Mercury by ICP-OES
- (4) With reference to IEC 62321-:2008. determination of Hexavalent Chromium by colorimetric Method using UV-Vis
- (5) With reference to IEC 62321-6:2015. determination of PBBs and PBDEs by GC-MS

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Cadnium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1000	mg/kg	2	ND
Mercury (Hg)	1000	mg/kg	2	ND
Hexavalent Chromium (Cr(VI))	1000	mg/kg	2	ND
Sum of PBBs	1000	mg/kg	-	ND
Monobromobiphenyl	-	mg/kg	5	ND
Dibromobiphenyl	-	mg/kg	5	ND
Tribromobiphenyl	-	mg/kg	5	ND
Tetrabromobiphenyl	-	mg/kg	5	ND
Pentabromobiphenyl	-	mg/kg	5	ND
Hexabromobiphenyl	-	mg/kg	5	ND
Heptabromobiphenyl	-	mg/kg	5	ND
Octabromobiphenyl	-	mg/kg	5	ND
Nonabromobiphenyl	-	mg/kg	5	ND
Decabromobiphenyl	-	mg/kg	5	ND
Sum of PBDEs	1000	mg/kg	-	ND
Monobromobiphenyl ether	-	mg/kg	5	ND
Dibromobiphenyl ether	-	mg/kg	5	ND
Tribromobiphenyl ether	-	mg/kg	5	ND



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Test Report	No. TSNHG17	02695901	Date 16 Feb 207	17 Page 3 of 5
<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Tetrabromobiphenyl ether	-	mg/kg	5	ND
Pentabromobiphenyl ether	-	mg/kg	5	ND
Hexabromobiphenyl ether	-	mg/kg	5	ND
Heptabromobiphenyl ether	-	mg/kg	5	ND
Octabromobiphenyl ether	-	mg/kg	5	ND
Nonabromobiphenyl ether	-	mg/kg	5	ND
Deacbromobiphenyl ether	-	mg/kg	5	ND

Notes .

(1) The Maximum permissible limit is quoted from directive 2011/65/EU, Annex II



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No. TSNHG1702695901 Date 16

Date 16 Feb 2017

Page 4 of 5

ATTACHMENTS

Cd/Pb/Hg/Cr⁶⁺/PBBs & PBDEs Flow Chart

- (1) Name of the person who made testing: Theresa Wei / Ivy Hou / Carri Yao
- (2) Name of person in charge of testing: Aaron Wang / Angell Yao / Rex Zhu
- (3) These samples were dissolved totally by preconditioning method according to below flow chart. (Cr⁶⁺ and PBBs / PBDEs test method excluded)





Test Report No. TSNHG1702695901 Date 16 Feb 2017 Page 5 of 5 Sample Photo:

SGS authenticate the photo on original report only

End of Report



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SCALE INHIBITION CERAMIC BALL

Description:

Scale Inhibition Ceramic Ball is made of natural mineral material and other bio material by high temperature sintering technology.

It is one kind of equipment protection product, it can prevent the formation of limescale in the shower head, faucet and water dispenser. Scale

Inhibition Ceramic Ball reacts with Ca, Mg ions in the water, and stopping the formation of CaCO₃, MgCO₃



	Parameters	Functions:
Diameter	2~10mm,	• Stop the formation of limescale.
Туре	Macro porous weakly alkaline ceramic ball	• Prevent the limescale
Form	Ceramic Ball	block the shower head and faucet.
Ph	7.5	• Absorb Ca, Mg ions
Bulk Density (g/cm ³)	1.35	from the water.
Application	Drinking water purification, Drinking water scale inhibition, Beverage juice process	

Test results

In a drinking water treatment side by side experiment using equal water volumes from the same source over a measured time of 1 hour, where one water was treated using SILIPHOS balls and the other water treated with an equal volume of Scale Inhibition Ceramic Balls , it was shown the scale inhibition efficiency of the Scale Inhibition Ceramic Balls is 5-10 times that of SILIPHOS Balls

Full further research papers on ceramics and scale control can be provided upon request

IMPROVED IONS EXCHANGE CERAMIC BALL

Description:

Improved Ions Exchange Ceramic Balls are one of the few natural ways to remove fluoride.

Improved Ions Exchange Ceramic balls have a higher performance on adsorbing functions because of the micro porous character, it can adsorb 99% ammonia nitrogen and fluoride.

They are also effective in removing other heavy metal such as arsenic, lead, cadmium etc. They can remove COD, make soft water and improve the taste of the water.

They're 5-10 times more efficient than resin and can be regenerated.



Р	Usa	age:	
Appearance	Micro Poles Structure	Humidifier:	30g~50g/L.
Structure	Micro pole diameter of 0.27~0.98nm	Shower filter	50g for 1 year
Chlorine & Chloramine Removal	7.5	Shower meet.	Sog for 1 year.
Fluoride Removal	99%	Purifier filter:	1kg for 100 tons of tan
Absorbing Performance	Good		water
Mineral Water	Yes		
Specific Area (m2/g)	>500		
Bulk Density (g/m3)	0.74-0.78		

Features of Ion Balance Ceramic Ball

- Makes water cluster smaller!
- Improves water taste!
- Emits negative ion!

INGREDIENT SPECIFICATIONS						
Al_2O_3	SiO ₂	K ₂ O	CaO	Na ₂ O	MgO	P_2O_5
27.16%	56.59%	1.88%	0.15%	1.15%	0	0
Fe ₂ O ₃ 0.49%	TiO ₂ 0.26%	Y ₂ O ₃ 0.09%	SO ₃ 0	ZrO ₂ 11.83%	Rb ₂ O 0.02%	<mark>Sr0</mark> 0.38%

TEST CERTIFICATED

FDA safety test(USA) & RoHS!

MAIFAN STONE BALL

Maifan stone ball is made of quality Maifan mineral stone powder, clay and multi-functional healthy ceramic materials heated at 800 degree, which could naturally enhance and activate the water and add more than 42 kinds of useful elements.

It has the character such as purifying water quality, restore the PH balance, activate water, improve the body's physiological function and etc.



It gives back minerals such as ionized calcium, magnesium, sodium, potassium ion, which were taken away while purifying the water. Maifan stone is widely used in medical, food and health, environment protection, water quality improvement, beverages, wine, medicine, deodorant, crops, flower cultivation, poultry, aquaculture etc. industries. The water treated by Maifan stone is dissolved with 14 kinds of trace elements and 15 rare earth elements. Maifan stone could also absorb the toxic substances caused by pollution.

Maifan Stone Maifan Stone is a special mineral rock which has for centuries been used to treat various skin diseases. It is primarily composed of silicate minerals including but not limited to plagioclase feldspar, orthoclase feldspar, hornblende, and biotite. Maifan Stone has a huge capacity for both ion exchange and the adsorption of soluble heavy metals and chemical impurities in the water, whilst providing a gentle release of rich minerals and raising pH alkalinity levels. Maifan Stone contains plenty of micro-nutrient elements, such as calcium, iron, zinc, magnesium, copper, and selenium, all essential to a healthy human body. It is especially useful in treating skin tumours and ulcers. In addition to that, many mineral water manufacturers in dissolve a small amount of Maifan Stone during the preparation of their product, which enhances the micro-nutrient density in the water. In ordinary cooking, both rice and tea, while being washed, may be dipped with Maifan Stone to increase their effects on health. Maifan Stones has an "ozone" effect by improving the biological activity of water with the dissolved oxygen concentration. This is also known as "activation" of water. It is for this reason why Maifan Stone is referred to as a "cell detergent". Maifan Stone has a double adsorption effect with a strong adsorption ability for heavy metal ions and toxins in the water, whilst also reducing the concentrations of bacteria, inhibiting its reproduction speed. Maifan Stone effectively removes mercury, lead, cadmium, arsenic and other heavy metals, fluoride, in addition to disinfection dissolved gases such as chlorine

All of our water treatment balls own all applicable international accreditations and meet the most stringent environmental applications such as Water Treatment, Water cycle and use and sewage treatment

Parameters			Functions:
Diameter	3~20mm, customerized	1.	Water activation
Apperance	Spherical ball		_
Hardness %	-	2.	Mineralization water
Specific Area cm2/g	>0.5*10^4		
Specific Density g/cm3	1.3~1.55	3.	Restore pH
Bulk Density (g/m3)	0.74~0.78		balance in your
Inner Porosity Rate %	20%		body
Bulk Porosity Rate %	39%	4.	Absorption heavy
Clay Percentage	<=0.13%		metal
Compression Strength N	>=40		
Filtering Rate m/h	10~18		
60 min Maifan Stone Ball Dissolved mg/L	40		
60 min E-coli absorption %	0.8376		
12h heavy metal absorption %	0.611		

The water treated by Maifan stone is dissolved with 14 kinds of trace elements and 15 rare earth elements. Trace elements dissolved by Maifan Stone Ball are listed as below:

	Unit Mg/L				
К	15.72	Fe	0.01	Мо	3.76
Na	18.55	H ₂ SiO ₃	80.56	Cu	7.6
Ca	19.34	Р	0.32	Со	0.384
Mg	5.88	F	0.9	Se	9.5
Mn	0.051	В	0.17	Li	0.36
Sr	0.99	Zn	0.22		

TOURMALINE CERAMIC BALL

Description:

Tourmaline ceramic ball is formulated with far infrared mineralization material and tourmaline material, heated at 860 degree. It can release 0.06mA bioelectricity which are similar to human body's biological



Parar	Advantages:	
Diameter	2~10mm	 Activate water and make 0.02 molecules
Apperance	Grey colour Spherical ball	water.
Material	Tourmaline, Crystal quartz,	• Ever-lasting eradiate
	Titanium oxide, zirconium oxide,	negative ions.
	mineral clay etc	• More than 97% FIR (far
Hardness %	85~95	infrared ray) with
Compression Strength N	>=40	spectrum of 2~18um.
Specific Area cm2/g	>0.5*104	• Making alkaline water.
Specific Density g/cm3	1.35~1.4	Absorbing micro
Bulk Density	0.74~0.78	particles and
Peak width at half height (Hz)	15~30	microorganisms.
Far-infrared emission rate (%)	87	• Tourmaline ceramic
Far-infrared wavelengths (um)	4~14	balls could also produce
Far-infrared bacteriostatic rate(%)	78.9	negative ions.

Due to reliable and ever lasting purifying and activation factions, tourmaline ceramic balls are widely used in many fields as following:

- Water purifying
- ♦ Water treatment
- ♦ Water Dispenser
- Cosmetics
- ♦ Bath etc.

INGREDIENT SPECIFICATIONS						
Al_2O_3	SiO ₂	K ₂ O	CaO	Na ₂ O	MgO	P_2O_5
15.99%	70.52%	3.10%	2.59%	3.05%	1.15%	0.23%
Fe_2O_3	TiO ₂	$Y_{2}O_{3}$	SO ₃	ZrO ₂	Rb ₂ O	Sr0
2.77%	0.33%	0.01%	0.13%	0.07%	0	0.06%

TEST CERTIFICATED

FDA safety test (USA)

FAR INFRARED WATER CERAMIC BALLS

Description:

Far infrared ceramic ball is specially designed for water purifying, water treatment, and improved water dispenser. Far infrared mineral water ceramic ball can release weak electric current in the process of treating water. It has an effective adsorption of lead (Pb + +) Chromium (Cr + +) and other toxicity heavy metals, and make dissolved zinc lithium, iodine, selenium and other trace elements in over 20. Far infrared ceramic balls have excellent performance in antibacterial, activation, absorption, filtering and water purification.



In addition to acting as an anti-ageing agent, Far infrared mineral water ceramic ball adds to the water of zinc lithium, iodine, selenium and other trace elements in over 20. It also strengthens the body's resistance to infectious diseases, increasing the oxygen capacity of the blood, and improving stress tolerance

Parame	Functions:	
Diameter Apperance Material	3~20mm red brown colour Spherical ball	 Micro-clustered water hydrate cells more effectively.
Hardnoss %	Titanium oxide, zirconium oxide, mineral clay etc	 Restore PH balance in your body. Essential minerals maintains optimal health.
Compression Strength N Specific Area cm2/g Specific Density g/cm3	<pre>>=40 >0.5*10^4 1.3~1.55</pre>	 Increase air negative ion concentration. Increase dissolved oxygen and activate water.
Bulk Density Peak width at half height (Hz) Far-infrared emission rate (%) Far-infrared wavelengths (um)	0.74~0.78 40~64.5 90 4~14	 6. Improve the taste of water. 7. Improve the taste of water. 8.
Far-infrared bacteriostatic rate(%)	/8.9	

INGREDIENT SPECIFICATIONS						
Al_2O_3	SiO ₂	K ₂ O	CaO	Na ₂ O	MgO	P_2O_5
24.69%	57.19%	43.46%	2.16%	0	0.66%	0.11%
Fe ₂ O ₃	TiO ₂	Y ₂ O ₃	SO ₃	ZrO ₂	Rb ₂ O	Sr0
11.18%	0.49%	0.01%	0	0.02%	0.02%	0.01%

TEST CERTIFICATED

FDA safety test(USA), RoHS

SECTION 7 Resume of Bio Ceramics Application tests carried out by Grosvenor House Hotel July / August 1994



1. A plate of Bio Ceramics was placed inside the wash tank of a Hobart FTX dishwasher.

It was noted that limescale formed on the plate, but did not appear on the wash arms or the stainless steel lining of the wash tank for up to 4 days. Without the Bio Ceramics plate in the wash tank, limescale would normally appear on the wash arms within 24 hours. The plate was left inside the wash tank of the dishwasher for 7 days, thereafter it was noted that very little limescale had built up inside the wash tank, compared with the heavy build up which was seen in the pre- wash tank.

It was also noted that the bad smells which are usually noticed in the dishwasher were eliminated while the Bio Ceramics plate was installed.

The same effect on limescale was noticed when a plate of Bio Ceramics was placed inside a pasta boiler and left for 7 days.

2. 2 plates of Bio Ceramics were placed inside an open cold food display unit, about 1 meter apart, and a fan unit containing Bio Ceramics pellets was placed over the display unit so that treated air was blown over the cold foods.

The vegetable remained fresher for longer periods, and the salad also stayed mesh and crisp for longer periods than usual. The display unit also remained ice-free as with tests 1 and 2.

Michael Culley