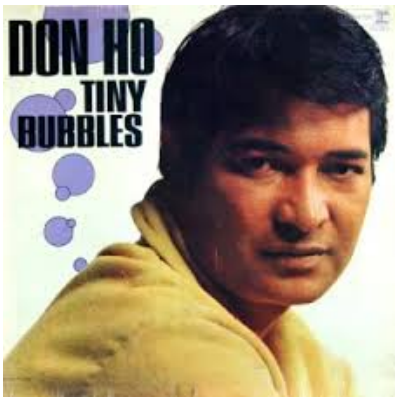
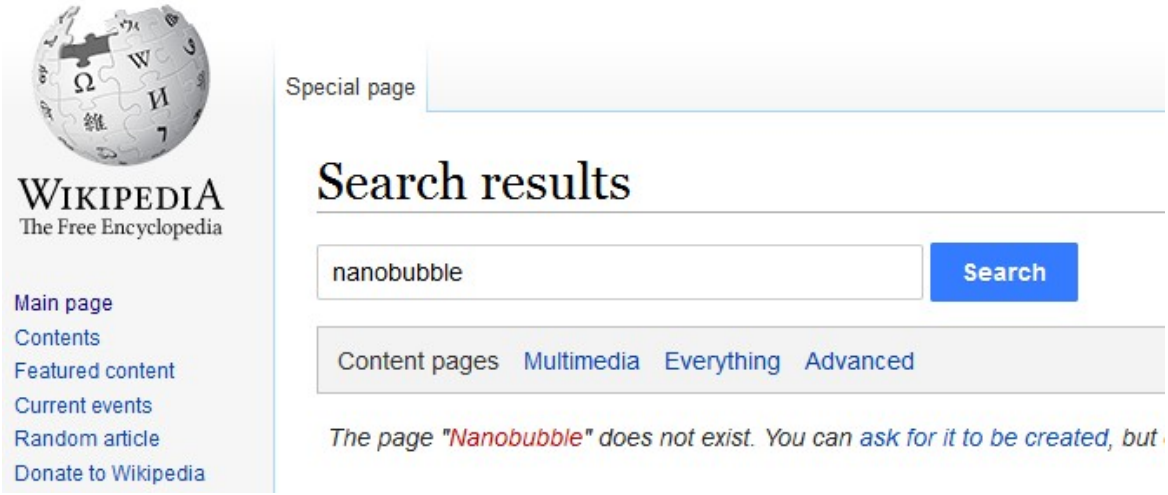
rexresearch.com

Nanobubble Water

Joyous Vindication of Don Ho !



So Newvo, Wikipedia doesn't have a page for it yet !



Freshwater and Saltwater fish can live together in it !
70% Effective vs Cancer !
Purifies water ...
Treats Gingivitis ...
Easily scalable, & Uses very little energy ...

Introduction (nanonet.nims.go.jp)

YouTube Videos

A. PUTNEY : Geyser Reactor Transmutation System (Excerpt)

malvern.com : Nanobubbles -- Detection and measurement of ultrafine bubbles

A. AGARWAL, *et al* : Principle and applications of microbubble and nanobubble technology for water treatment"

Patents

US7749692 : Tissue preservation method comprising contacting tissue with a solution of nanobubbles and salt
JP5120998 : Tissue-Preserving Solution
US8147876 : Medical agent for preventing or treating diseases...
US8137703 : Ozone water and production method therefor
US8349192 : Method for collapsing microbubbles
US8821160 : Nano Bubble Generating Nozzle & Oral Cleaning Device...
US8919747 : Super-micro bubble generation device
US20070189972 : Method of forming nanobubbles
US20100151043 : Preparation for Sterilization or Disinfection of Tissue

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Introduction :

http://nanonet.nims.go.jp/english/magazine/index.php?Vol.%203%2C%20No.%201%2C%202010-08-30%2FGreen%20Nanotechnology%20Special%20Topic%206

4.1 Oxygen nanobubbles

Oxygen nanobubbles can be generated by the production of oxygen microbubbles in water containing nearly 1% NaCl followed by jetting the water towards a punching plate so that it passes through small holes in it.[8] "Oxygen nanobubbles have a mysterious function that can invigorate living organisms. We have been clarifying the mechanism behind such a phenomenon occurring between nanobubbles and living organisms but still need more time to clarify the mechanism." said Dr. Takahashi. Let us now focus on the enigmatic findings obtained from his experiments.

(1) Coexistence of freshwater and seawater fishes in one aquarium

It is possible to breed koi carp and sea bream together for several months in the same water tank containing 1% salt with oxygen nanobubbles (Fig.14). Neither fish could survive without the nanobubbles, even though the salt concentration of 1% is almost equal to the electrolyte concentration of their body fluid. In general, red sea bream is vulnerable to changes in salt concentration, and koi carp also has difficulty in surviving in water containing 1% salt. Goldfish, however, are not vulnerable to changes in salt concentration.

図 14　淡水魚と海水魚の同居水槽

図 15　水中で胡蝶蘭の育成

Fig.14 (left) Coexistence of freshwater and seawater fish in a water tank.
Fig.15 (right) Phalaenopsis orchid in water.

"The fish in this tank would die from oxygen deficiency if we stopped regularly bubbling air through the water. This suggested to us that oxygen nanobubbles act not directly on respiratory and metabolic systems but through a different mechanism.

4.2 Ozone nanobubbles

Ozone nanobubbles are generated by collapsing, for example, ozone microbubbles in underground water sampled from coastal areas (containing about 1% electrolytes such as NaCl)[4]. The bactericidal power of conventional ozonated water is effective only for a few hours, whereas water containing ozone nanobubbles retains its power for months without significant deterioration if it is preserved under UV-blocked conditions. The excellent bactericidal power is shown using the example of an oyster. The surface of an oyster was sterilized using conventional ozonated water and hypochlorous acid, but the bacteria inside its body were not sterilized. For an oyster left for 8 h in water containing ozone nanobubbles, on the other hand, bacteria such as norovirus were eliminated from the oyster's body while the oyster was alive (Fig.16). This sterilizing technology has already been adopted by some seafood companies, and has markedly reduced the number of complaints about their products.

図 16　オゾンナノバブルによるカキの殺菌

Fig.16 Sterilization of oyster using ozone nanobubbles.

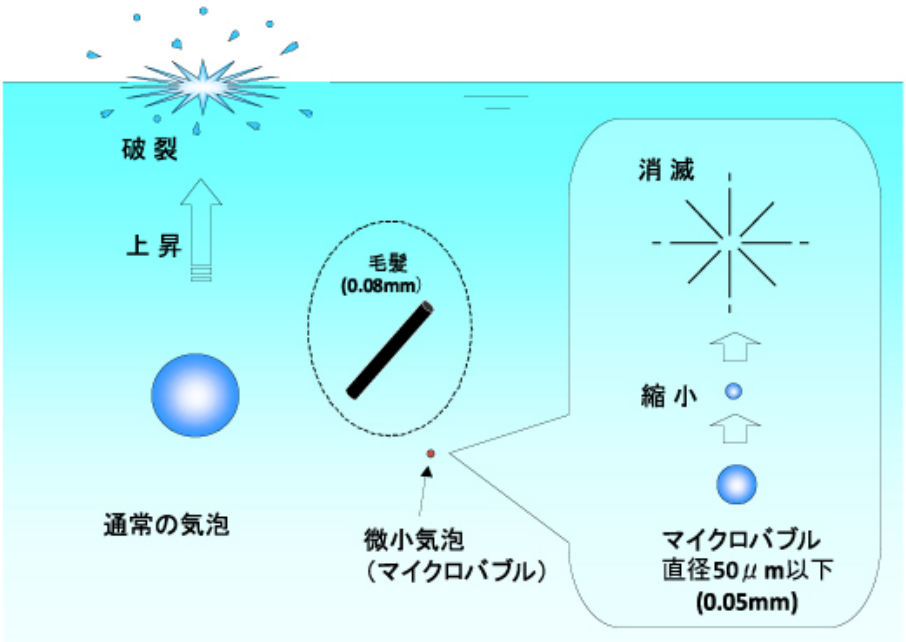

図 1　マイクロバブルの特徴

	Bubble type	Definition	Bubble size	Production Methods	Properties/Applications
1	Ordinary bubble	Rapidly rises through water and bursts at the surface.	>50 μm	—	**Applications** ① Aeration to increase dissolved oxygen content: water quality improvement.
2	Micro-Bubble	Continuously shrinks in water until its dis-appearance (complete dissolution: collapse)	<50 μm	① Compression/ decompression ② Gas-liquid two-phase flow eddying	**Properties** ① Anti-aggregation: negatively charged surface prevents bubble aggregation (properties of microbubble surface potential: Fig. 7). ② Increases dissolved gas content: facilitates dissolution of interior gas in water (microbubble's slow rising rate: Fig. 5, self-pressurization: Fig. 6, Henry's law). ③ High oxidizing/sterilizing capacity: collapse of a microbubble generates •OH free-radical with extremely high oxidizing capacity (release of energy accumulated as concentrated ionic charge on the microbubble surface: Figs. 11, 12). ④ Relatively short longevity (Fig. 6): short half-life. **Applications** ① Environmental remediation ② Cleaning, chemical engineering ③ Agriculture and fishery
3	Nano-bubble	Exhibits temporal or long-term stability	<1 μm	A part of naturally collapsing microbubbles remain as nanobubbles. By forcing a physical stimulus on them in the presence of electrolytes such as Na, Mg, Fe, Mn, a longer longevity can be attained.	**Properties** ① Longer persistence with the formation of an ionic shell (Figs. 12, 13) → can be used as a liquid medicine. ② High oxidizing/sterilizing capacity: ozone nanobubbles have high oxidizing capacity and can be used as a sterilizing agent. ③ Biological activation: oxygen nanobubbles enhance biological activity. ④ High permeability: as nano-particles, their effects are manifested at the cellular level beyond the surface of organisms (Figs. 14, 15, 16). **Applications** ① Functional water ② Biotechnology, medicine ③ Food

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https://www.youtube.com/watch?v=HIGNdO_tIMs

Nanobubble Water from Japan

https://www.youtube.com/watch?v=OR57AGY3shM

Carbon-based Ceramic Nanobubble Nozzle Technology developed by Satoshi Anzai of Anzai Kantetsu

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http://www.human-resonance.org/geyser_reactor.html
08.13.2014

Resonance in the Geyser Reactor System

The Geyser Reactor Transmutation System

by

Alex Putney
(Human-Resonance.org)

...Kaneo Chiba of Reo Lab. Co. demonstrated production and application of nanobubbles in various processes, including bulk waste treatment, food sterilization and preservation with ozone nanobubbles, in addition to health enhancement of most aquatic and terrestrial organisms exposed to oxygen nanobubbles. Initial processes for nanobubble production involved cavitation with ultrasound, yet simple carbon-based ceramic nozzles developed by Satoshi Anzai of Anzai Kantetsu Co. presented an extremely cost effective production method in 2014:

As the main component of this class of carbon-ceramics, amorphous carbon particles (SEM above) contribute micron-sized pores to the composite material that allow passage of gas under low pressure through the nozzles to generate micron-sized bubbles from submerged nozzle surfaces. In still water, microbubbles rapidly coalesce to form larger bubbles that cannot remain suspended in the liquid medium but escape to the water's surface.

However, investigation of the behavior of microbubbles produced from the carbon-based ceramic surfaces into a narrow jet of fast-flowing water revealed several surprising phenomena (below). The rapid motion of microbubbles torn away from nozzle surfaces begins a process known as adiabatic compression leading to collapse by isothermal evolution, whereby reducing in size during the course of several minutes to form nanobubbles (Ohgaki et al., 2010).

During the microbubbles' decrease in size due to surface tension effects driving the dissolution of interior gases into the surrounding liquid, reactive oxygen species (ROS) are generated that decompose organic chemicals and contribute to the beneficial breakdown of toxins within biological systems and the natural environment. Stabilization as long-lived nanobubbles occurs when ions bind to the gas/liquid interface, yet display full collapse and complete dissolution after several minutes in the absence of bound ions.

Longterm studies of the longevity of gas nanobubbles stabilized at <200nm in size in bottled water samples have shown their presence in significant quantity several months after the infusion and bottling process (Takahashi, 2005). Nanobubble stabilization is also influenced by repulsive electrostatic forces due to surface charging, and may be maintained over long periods in colloidal suspensions of silver nanoparticles. Studies of nanoscale forces and fluid/gas dynamics reveal many surprising properties that contribute significantly to our understanding of basic metabolic processes that determine the cellular health of living organisms and entire ecosystems.

Use of carbon-based ceramic nozzles with Geyser Reactor transmutation systems confirms nanobubble technology to represent a cost-effective solution for the efficient bulk delivery of carbon dioxide gas for binding with silver nanoparticles and rapid absorption under ambient pressures. Bulk binding of gas nanobubbles with metal nanoparticles replicates the metabolic activity of hemoglobin in red blood cells, enabling high gas absorption and bulk transmutation rates that far exceed those associated with resonant transmutation in healthy organisms, even under bioelectrification conditions that increase absorption of gases by metals within the body's tissues.

A compact device for producing gas nanobubbles remains the only component of the Geyser Reactor system not readily available, requiring fabrication from special gas permeable materials. While the carbon-ceramic nozzles developed and demonstrated by Anzai Kantetsu represent cost-effective alternatives to high-pressure, high-temperature cavitation machines for nanobubble production, their new nozzles are not yet available for order.

Carbon-ceramics are manufactured by wet packing 60% carbon, 40% clay powder mixtures into nozzle molds before drying and firing @ >1000°C in a reducing or inert gas atmosphere. Viable carbon-ceramics that allow the passage of gas through micropores are commonly used for high-temperature glass and metal casting applications, and can be easily fabricated into a nozzle by reshaping carbon-ceramic mold materials into the desired form.

However, an even simpler nanobubble device has been integrated into the design of the Geyser Reactor system, consisting of a pyrolyzed segment of hardwood tree branch that maintains the natural nanoarchitecture of living wood, generally referred to as 'biological charcoal'. The natural

nanopiping of tree wood employs surface wetting effects for pumping water up to the leaves, sometimes hundreds of feet into the sky, yet also facilitates production of nanobubbles. Electron microscopy reveals the complex nanostructures of biocharcoal, presenting networks of carbon nanotubes arranged lengthwise in concentric rings with interconnecting nanopores (SEM above).

Biocharcoal nozzles offer the same basic nanobubble characteristics demonstrated by the carbon-ceramics of Anzai Kantetsu --at a much lower cost of just 25¢ per nozzle-- reflecting the simple natural solutions of Ayurveda. By carefully selecting and tooling the surfaces of a pyrolyzed hardwood branch segment that has no large pores or cracks, and sealing the central channel which tends to be much larger than the nanotubes arranged in concentric rings, an extremely cheap alternative can be produced with minimal cost and effort, in any part of the world.

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http://www.malvern.com/en/industry-applications/sample-type-form/nanobubbles/default.aspx

Nanobubbles -- Detection and measurement of ultrafine bubbles

Acceptance of and interest in the special properties of nanobubbles (also termed as ultrafine bubbles) is growing rapidly, and their formation and characteristics are the subject of an increasing amount of study, particularly in Europe and Japan.

Due to the theoretically very high pressure within nanobubbles of such small size and radius of curvature and thus high surface tension, conventional calculations show that gas should be ‘pressed out’ of the nanobubble within microseconds. However, it is now clear that, under the right conditions, nanobubbles can form freely and remain stable for extended periods of time, sometimes for many months.

Applications for solutions containing nanobubbles include facility cleaning, solar cell manufacturing and plant growth. Many more applications are emerging rapidly.

Malvern’s NanoSight range of instruments features prominently in nanobubble research publications. Similarly, the Zetasizer Nano range of instruments can also be used for the characterization of nanobubbles. All of these instruments provide fast, reliable, accurate and reproducible information about your product.

In addition, Archimedes provides information previously unavailable to nanobubble researchers: clear differentiation between gas bubbles in solution and contaminants that may be present. Resonant mass measurement is therefore able to supply a clear, reproducible analysis of the concentration and purity of your nanobubble product.

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http://www.sciencedirect.com/science/article/pii/S0045653511006242
Chemosphere 84 (9): 1175–80.
doi:10.1016/j.chemosphere.2011.05.054. PMID 21689840.

"Principle and applications of microbubble and nanobubble technology for water treatment".

Agarwal, Ashutosh; Ng, Wun Jern; Liu, Yu (2011).

Abstract : In recent years, microbubble and nanobubble technologies have drawn great attention due to their wide applications in many fields of science and technology, such as water treatment, biomedical engineering, and nanomaterials. In this paper, we discuss the physics, methods of generation of microbubbles (MBs) and nanobubbles (NBs), while production of free radicals from MBs and NBs are reviewed with the focuses on degradation of toxic compounds, water disinfection, and cleaning/defouling of solid surfaces including membrane. Due to their ability to produce free radicals, it can be expected that the future prospects of MBs and NBs will be immense and yet more to be explored.

Patents

US7749692
Tissue preservation method comprising contacting tissue with a solution of nanobubbles and salt

Abstract: An object of the invention is to provide a tissue preservation solution that has excellent tissue-preserving ability and is useful in the field of medicine, medical experiment, etc. Thus, the invention relates to a tissue preservation solution including oxygen nanobubbles.

JP5120998
TISSUE-PRESERVING SOLUTION

The present invention relates to a tissue preservation solution that is useful in the field of medicine, medical experiment, etc.

US8147876
Medical agent for preventing or treating diseases...

The present invention relates to a medical agent for preventing or treating diseases resulting from inflammation or remodeling, particularly diseases such as arteriosclerosis, heart failure, cerebrovascular disorder, and hypertensive kidney disease; and to a method for preventing or treating the diseases.

US8137703
Ozone water and production method therefor

Abstract: The present invention relates to an ozone water that has the potential to find useful applications in a wide variety of technical fields and is capable of maintaining the effects of wiping out microorganisms such as bacteria, viruses and the like and inhibiting the growth thereof over long periods. The present invention provides ozone nano-bubbles capable of staying in a solution for an extended period of time and a method for producing the ozone nano-bubbles by instantaneously shrinking the diameters of ozone microbubbles contained in an aqueous solution by the application of a physical irritation to the ozone microbubbles in an aqueous solution.

US8349192
Method for collapsing microbubbles

Abstract: A method for collapsing a microbubble includes applying stimulation to the microbubble during the gradual decrease of the its size. As a result, the microbubble floating in a solution that decreases in size due to the natural dissolution of a gas contained in the microbubble and disappears after a while, has the speed of its size decrease enhanced and causes the microbubble to disappear.

US8821160
NANO BUBBLE GENERATING NOZZLE AND ORAL CLEANING DEVICE INCLUDING THE SAME

Abstract : Disclosed is a nano bubble generating nozzle including: a passage passing through an interior thereof to provide a flow path through which liquid flows; a nano bubble generating part corresponding to a part of the passage, and formed such that a cross-section of the nano bubble generating part becomes small and then large again along a flow path of liquid so that the nano bubble generating part has a pressure lower than an external pressure of the nozzle body; and a gas inlet formed in the nozzle body, and connected to the nano bubble generating part so that gas is introduced into the nano bubble generating part due to a difference between an external pressure of the nozzle body and a pressure in the nano bubble generating part.

US8919747
Super-micro bubble generation device

Abstract : Provided is a super-micro bubble generation device providing super-micro bubbles using a simple method and having a higher degree of freedom of installation so as to be suitable for a place where the device is to meet functional requirements. A super-micro bubble generation device is provided with a compressor for delivering gas under pressure, and also with a bubble generation medium for discharging the gas, which has been delivered under pressure, as super-

micro bubbles into liquid. The bubble generation medium consists of a high-density compound which is an electrically conductive substance. The super-micro bubble generation device is also provided with a liquid jetting device for jetting liquid in the direction substantially perpendicular to the direction in which the bubble generation medium discharges the super-micro bubbles, said liquid being the same kind of liquid as the liquid into which the super-micro bubbles are discharged.

US20070189972
Method of forming nanobubbles

Abstract : The present invention relates to a method of forming nanobubbles that have potential utility in every industrial application and that impart special functions, especially to water. The present invention is a method of forming nanobubbles by applying physical irritation to microbubbles contained in a liquid so that the microbubbles are abruptly contracted to form nanobubbles

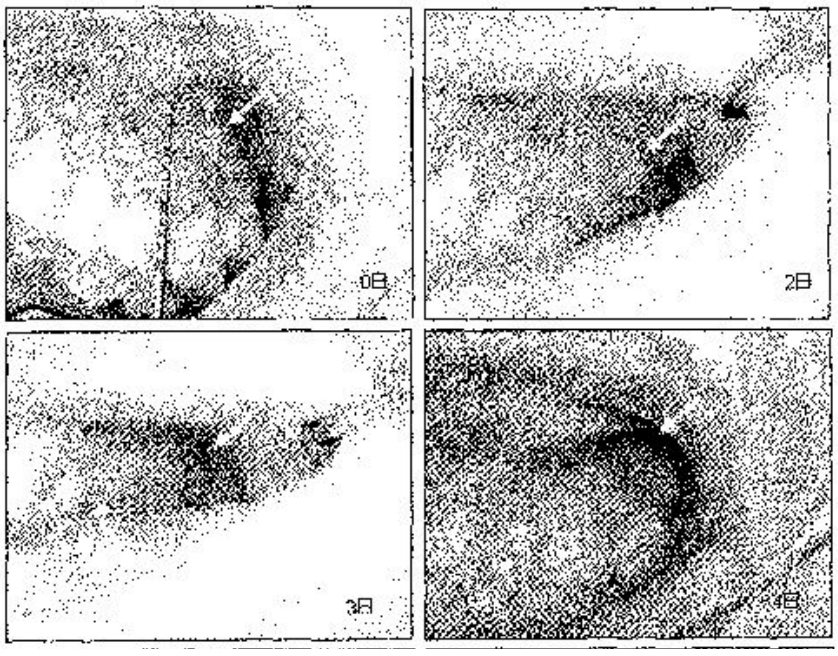
US20100151043
PREPARATION FOR STERILIZATION OR DISINFECTION OF TISSUE

Abstract: The present invention relates to a preparation for sterilizing or disinfecting a tissue which has an excellent tissue sterilizing or disinfecting ability and is suitable for therapeutic or prophylactic treatment of various diseases caused by a microorganism such as a bacterium or a virus and a method for sterilizing or disinfecting a tissue. The present invention relates to a preparation for sterilizing or disinfecting a tissue and an agent for therapeutic or prophylactic treatment of a periodontal disease, characterized by containing a gas in a nanobubble state. Furthermore, the present invention relates to the above-mentioned preparation for sterilizing or disinfecting a tissue, characterized in that the above-mentioned gas in a nanobubble state is ozone. Furthermore, the present invention relates to a liquid preparation for sterilizing or disinfecting a tissue, characterized by comprising ozone-nanobubble water.

WO2008072370 / JP5255451
PREPARATION FOR TISSUE REPAIR OR REGENERATION

The invention relates to a preparation for tissue repair or regeneration and a method for tissue repair or regeneration, which are excellent in tissue repair or regeneration capability and suitable for treating or preventing various diseases or injuries accompanied by tissue changes such as damage or degeneration. The invention relates to a preparation for tissue repair or regeneration, and a therapeutic or preventive agent for stomatitis, characterized by containing a gas in a nanobubble form. Further, the invention relates to the preparation for tissue repair or regeneration, characterized in that the gas in a nanobubble form is oxygen. Further, the invention relates to a liquid preparation for tissue repair or regeneration, characterized by containing oxygen nanobubble water.

[図1]



[図2]