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Bubble Power

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ABSTRACT

In sonofusion a piezoelectric crystal attached to liquid filled Pyrex flask send pressure waves through the fluid, exciting the motion of tiny gas bubbles. The bubbles periodically grow and collapse, producing visible flashes of light. The researchers studying these light emitting bubbles speculated that their interiors might reach such high temperature and pressure they could trigger fusion reaction. Tiny bubbles imploded by sound waves can make hydrogen nuclei fuse- and may one day become a revolutionary new energy source. When a gas bubble in a liquid is excited by ultrasonic acoustic waves it can emit short flashes of light suggestive of extreme temperatures inside the bubble. These flashes of light known as sonoluminescence, occur as the bubble implode or cavitates.

It is show that chemical reactions occur during cavitations of a single, isolated bubble and yield of photons, radicals and ions formed. That is gas bubbles in a liquid can convert sound energy in to light. Sonoluminescence also called single-bubble sonoluminescence involves a single gas bubble that is trapped inside the flask by a pressure field. For this loud speakers are used to create pressure waves and for bubbles naturally occurring gas bubbles are used. These bubbles cannot withstand the excitation pressures higher than about 170 kilopascals. Pressures higher than about 170 kilopascals would always dislodge the bubble from its stable position and disperse it in the liquid. A pressure at least ten times that pressure level to implode the bubbles is necessary to trigger thermonuclear fusion. The idea of sonofusion overcomes these limitations.

I.INTRODUCTION

Sonofusion is technically known as acoustic inertial confinement fusion. In this we have a bubble cluster (rather than a single bubble) is significant since when the bubble cluster implodes the pressure within the bubble cluster may be greatly intensified [1-3]. The centre of the gas bubble cluster shows a typical pressure distribution during the bubble cluster implosion process. It can be seen that, due to converging shock waves within the bubble cluster, there can be significant pressure intensification in the interior of the bubble cluster [4-6]. This large local liquid pressure (P>1000 bar) will strongly compress the interior bubbles within the cluster, leading to conditions suitable for thermonuclear fusion [7-9]. More over during the expansion phase of the bubble cluster dynamics, coalescence of some of interior bubbles is expected, and this will lead to the implosion of fairly large interior bubbles which produce more energetic implosions [10].

The apparatus consists of a cylindrical Pyrex glass flask 100 m.m. in high and 65m.m.in diameter. A lead-zirconate-titanate ceramic piezoelectric crystal in the form of a ring is attached to the flask's outer surface. The piezoelectric ring works like the loud speakers in a sonoluminescence experiment, although it creates much stronger pressure waves [11-12]. When a positive voltage is applied to the piezoelectric ring, it contracts; when the voltage is removed, it expands to its original size.

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The flask is then filled with commercially available deuterated acetone (C 3 D 6 O), in which 99.9 percent of the hydrogen atoms in the acetone molecules are deuterium (this isotope of hydrogen has one proton and one neutron in its nucleus). The main reason to choose deuterated acetone is that atoms of deuterium can undergo fusion much more easily than ordinary hydrogen atoms. Also the deuterated fluid can withstand significant tension (stretching) without forming unwanted bubbles. The substance is also relatively cheap, easy to work with, and not particularly hazardous.

- •conventional fuels are getting depleted at a very fast rate
- •One of the conventional methods of producing bulk energy is nuclear fision & nuclear fusion
- •In nuclear Fusion atomic nuclei are fused together
- •In Nuclear Fision atoms are split by neutrons releasing huge amount of energy •Bubble Power'-the revolutionary new energy source
- •It is working under the principle of Sono fusion
- •It was derived from a related phenomenon known as sonoluminescenc

1.1 BASIC REQUIREMENTS

- Pyrex flask
- Vacuum pump
- Piezoelectric crystal
- Wave generator
- Amplifier
- Neutron generator
- Neutron and gamma ray detector
- Photomultiplier
- Microphone & speaker

1.2 APPLICATIONS

1) Thermonuclear fusion gives a new, safe, environmental friendly way to produce electrical energy.
2) This technology also could result in a new class of low cost, compact detectors for security applications. That use neutrons to probe the contents of suitcases.
3) Devices for research that use neutrons to analyse the molecular structure of materials.
4) Machines that cheaply manufacture new synthetic materials and efficiently produce tritium, which is used for numerous applications ranging from medical imaging to watch dials.
5) A new technique to study various phenomenon's in cosmology, including the working of neutron star and black holes.

III. SONOLUMINESCENCE

When a gas bubble in a liquid is excited by ultrasonic acoustic waves it can emit short flashes of light suggestive of extreme temperatures inside the bubble. These flashes of light known as sonoluminescence, occur as the bubble implode or cavitates. It is show that chemical reactions occur during cavitations of a single, isolated bubble and yield of photons, radicals and ions formed. That is gas bubbles in a liquid can convert sound energy in to light.

Sonoluminescence also called single-bubble sonoluminescence involves a single gas bubble that is trapped inside the flask by a pressure field. For this loud speakers are used to create pressure waves and for bubbles naturally occurring gas bubbles are used. These bubbles cannot withstand the excitation pressures higher than about 170 kilopascals.

Pressures higher than about 170 kilopascals would always dislodge the bubble from its stable position and disperse it in the liquid. A pressure at least ten times that pressure level to implode the bubbles is necessary to trigger thermonuclear fusion. The idea of sonofusion overcomes these limitation.

3.1 THE IDEA OF SONOFUSION

It is hard to imagine that mere sound waves can possibly produce in the bubbles, the extreme temperatures and pressures created by the lasers or magnetic fields, which themselves replicate the interior conditions of stars like our sun, where fusion occurs steadily.

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Nevertheless, three years ago, researchers obtained strong evidence that such a process now known as sonofusion is indeed possible. Sonofusion is technically known as acoustic inertial confinement fusion. In this we have a bubble cluster (rather than a single bubble) is significant since when the bubble cluster implodes the pressure within the bubble cluster may be greatly intensified. The centre of the gas bubble cluster shows a typical pressure distribution during the bubble cluster implosion process.

It can be seen that, due to converging shock waves within the bubble cluster, there can be significant pressure intensification in the interior of the bubble cluster. This large local liquid pressure (P>1000 bar) will strongly compress the interior bubbles with in the cluster, leading to conditions suitable for thermonuclear fusion. More over during the expansion phase of the bubble cluster dynamics, coalescence of some of interior bubbles is expected, and this will lead to the implosion of fairly large interior bubbles which produce more energetic implosions.

3.2 HOW SONOFUSION WORKS

- Action of vacuum pump.
- Fill the flask with deuterated acetone.
- For initiation an oscillating voltage of 20 kHz applied to the ring.
- Fire a pulsed neutron generator.

3.3 SONOFUSION

The apparatus consists of a cylindrical Pyrex glass flask 100 m.m. in high and 65m.m.in diameter. A leadzirconatetitanate ceramic piezoelectric crystal in the form of a ring is attached to the flaskâ„¢s outer surface. The piezoelectric ring works like the loud speakers in a sonoluminescence experiment, although it creates much stronger pressure waves. When a positive voltage is applied to the piezoelectric ring, it contracts; when the voltage is removed, it expands to its original size. The flask is then filled with commercially available deuterated acetone (C3D6O), in which 99.9 percent of the hydrogen atoms in the acetone molecules are deuterium (this isotope of hydrogen has one proton and one neutron in its nucleus). The main reason to choose deuterated acetone is that atoms of deuterium can undergo fusion much more easily than ordinary hydrogen atoms. Also the deuterated fluid can withstand significant tension (stretching) without forming unwanted bubbles. The substance is also relatively cheap, easy to work with, and not particularly hazardous.

IV. ACTION OF VACUUM PUMP

The naturally occurring gas bubbles cannot withstand high temperature and pressure. All the naturally occurring gas bubbles dissolved in the liquid are removed virtually by attaching a vacuum pump to the flask and acoustically agitating the liquid.

V. ACTION OF THE WAVE GENERATOR

To initiate the sonofusion process, we apply an oscillating voltage with a frequency of about 20,000 hertz to the piezoelectric ring. The alternating contractions and expansions of the ring-and thereby of the flask-send concentric pressure waves through the liquid. The waves interact, and after a while they set up an acoustic standing wave that resonates and concentrates a huge amount of sound energy. This wave causes the region at the flaskâ„¢s centre to oscillate between a maximum (1500kpa) and a minimum pressure. (-1500kpa).

VI. ACTION OF THE NEUTRON GENERATOR

Precisely when the pressure reaches its lowest point, a pulsed neutron generator is fired. This is a commercially available, baseball bat size device that sits next to the flask. The generator emits high-energy neutrons at 14.1 mega electron volts in a burst that lasts about six microseconds and that goes in all directions.

VII. FULLY SELF SUSTAINED

To make the fusion reaction fully self-sustaining arranging the setup so it produces a continuous neutron output without requiring the external neutron generator. One of the possible ways is to put two complete apparatuses side by side so that they would exchange neutrons and drive each other fusion reactions. Imagine two adjacent sonofusion setups with just one difference: when the liquid pressure is low in one, it is high in the other. That is, their pressure oscillations are 180 degrees out of phase. Suppose hit the first apparatus with neutrons from the external neutron generator, causing the bubble cluster to form inside the first flask. Then turn off the neutron generator permanently. As the bubble cluster grows and then implodes, it will give off neutrons, some of which will hit the neighbouring flask. If all is right, the neutrons will hit the second flask at the exact moment when it is at the lowest pressure, so that it creates a bubble cluster there. If the process repeats, get a self-sustaining chain.

VIII. ADVANTAGES

1. It is self-sustainable.
2. Easily controllable.
3. It consistently produces more energy than it consumes.
4. Low cost.
5. Easily available raw materials.
6. Environmental friendly.

IX. CONCLUSION

With the steady growth of world population and with economic progress in developing countries, average electricity consumption per person has increased significantly. Therefore seeking new sources of energy just important, it is necessary. So for more than half a century, thermonuclear fusion has held out the promise of cheap clean and virtually limitless energy.

Unleashed through a fusion reactor of some sort, the energy from 1 gram of deuterium, an isotope of hydrogen, would be equivalent to that produced by burning 7000 liters of gasoline. Deuterium is abundant in ocean water, and one cubic kilometer of seawater could, in principle, supply all the energy needs for several hundred years.

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