SONOLUMINESCENCE, COLD FUSION, AND BLUE WATER LASERS

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The blue light observed in sonoluminescence experiments with water is explained, in this model, by Rayleigh scattered ambient UV light reflected in a blue Raman line of water. The ambient UV light incident on the spherical liquid geometry is concentrated to a high intensity and reflected in a Raman line that appears to the observer as blue light. The spherical liquid geometry functions as a spherical UV lens that concentrates ambient UV light at the center of the water compression field. By providing an external spherical UV laser cavity driver concentric to the spherical liquid lens, the concept of a cold fusion blue water laser is developed where the laser driver is pulsed with the acoustic field to fuse the deuterium in heavy water molecules. Therefore (according to this model) the blue water laser is a cold fusion device because the liquid structure required in concentrating the UV light would only operate below about 50 C, say in an application as a residential heater, even though the local hot fusion reaction is actually producing the heat.

Sonoluminescence (SL) is described [1] as a non-equilibrium phenomenon in which the energy in a sound wave becomes highly concentrated so as to generate synchronous repetitive flashes of blue light in liquid water at room temperature. With regard to cold fusion, SL as a significant mechanism of energy focusing in combination with a heavy D-O-D water target [2] is important because it would offer the prospect of a mechanism of fusing deuterium at room temperature.

In the standard model [3] for SL, bubble collapse energy is delivered to a number of molecules and the molecules are excited to emit blue light upon recombination. However, it is possible that the blue light observed in SL is nothing more than concentrated Rayleigh scattered light reflected in the blue Raman line of water. The Raman effect is the phenomenon of light scattering from the material medium whereby the light undergoes a frequency change in contrast to Rayleigh scattering where a frequency change does not occur.

The SL explanation given here is that the low intensity ambient UV light scattered inside the spherical water geometry is concentrated at the center of the compression field and reflected to the observer as a visible blue Raman line of water. This SL explanation is referred hereinafter as the Light Scattering (LS) model.

In contrast, the standard SL model contends the blue light is generated in the water. Since the ambient UV light is not visible, the appearance of blue light alone may have led the observers [1] to conclude that the blue light was being emitted from the water consistent with the standard SL model when, according to the LS model, the blue light is reflected ambient UV light.

In the standard SL model, light absorption for hydrogen takes place on the order of 10 ns. However, the data [1] shows that duration of the blue light < 100 ps. The LS model response based on Rayleigh and Raman scattering does not involve light absorption and takes place within the period of vibration. For blue light the response is < 1 fs, and may explain why the flashes cannot be resolved with the fastest photomultiplier tubes available.

Raman emission data [4] of water for various frequencies of exciting mercury light shows that for blue light to be emitted in a prominent Raman at 470 nm, the Rayleigh scattered incident UV line is required to be about 405 nm. The Raman lines are caused by totally symmetric O-H vibrations of the water molecule. The LS model contends that the 470 nm blue light observed during SL in water is actually a Raman line corresponding to incident UV light at 405 nm.

The standard SL model finds difficulty in explaining the data [1] which reports a 3.3 ev photon energy at a frequency of 8.0^{14} Hz which corresponds to a wavelength of 375 nm, but the observer sees a blue light at 470 nm. The LS model contends that in addition to reflected blue light, ambient UV light may also be also reflected to produce a UV spectrum of Raman emission, and the 375 nm wavelength is the spectrum average. This lowering may be due to a prominent Raman line at 350 nm in water that corresponds to a 313 nm UV exciting line [4].

With regard to verification of the LS model, polarization measurements of the reflected blue light in the SL experiment [1] should be made. Since Raman emissions from water are highly polarized, the LS model predicts that the intensity of the blue light as viewed through the polarizer will be significantly diminished. If so, not only is the correctness of the LS model verified, but more importantly, the spherical liquid lens formed in the compression field of the water offers a controllable mechanism for the concentration of the ambient UV light.

The concept of the cold fusion blue water laser finds basis in the observation of the significant concentration of ambient UV light by the spherical water lens during SL and is illustrated in Fig. 1. A surrounding UV laser cavity congruent to the spherical compression field lined with mercury lamps emitting UV radiation in the 300 to 400 nm range is flashed in sync with the SL acoustic frequency. Diametrically opposite inlet and outlet openings in the spherical arrangement may be made without affecting the isotropic irradiation of the water molecules to provide a through flow of heavy water to transfer the fusion energy to a heat sink. During blue water laser operation using heavy water, the water molecules at the center of the spherical compression field may be ionized to high temperatures causing the fusion of deuterium in the molecules and a possible fusion energy release. The fusion plasma may be contaminated by the oxygen in the water molecule itself, but this may not be a problem because the very large concentration of UV energy may accommodate the radiation loss and still achieve local fusion temperatures for deuterium. In this arrangement, the blue water laser may find application as a residential heater by increasing ambient water temperature to about 50 C without a loss of the spherical liquid lens structure.

The cold fusion blue water laser is similar to the Inertially Confined Fusion Reactor (ICFR) hot fusion concept [5] where fabricated D-T fuel pellets are ignited at fusion temperatures by imploding the fuel pellets through laser ablation of the exterior pellet surface. The ICFR requires the fuel pellet to be repetitively fabricated and precisely positioned at the center of the reactor prior to ignition. Further, the ICFR requires high energy MJ lasers because the minimal pellet size is limited by the fabrication and positioning process. However, the blue water laser is a far simpler concept because the water molecules at the center of the compression field function as the pellet and are continually replenished in repetitive ignitions. Since the fusing deuterium water molecules are very small quantities of fuel, the required UV laser energy for ignition is similarly a very small fraction of the ICFR laser energy, and therefore the blue water laser would make possible ignition of the neutron free D-D reaction, instead of opting for the lower energy D-T reaction with attendant radioactivity problems. Instead of the large size of laser drivers common with the ICFR, the mercury lamp arrangement is a simple and compact laser driver, and therefore miniature blue water lasers providing a limitless supply of low temperature water < 50 C for residential home heating may be envisioned.

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Editor's Note: This model for sonoluminescence may or may not be correct. Readers should also read the following paper wherein Nobel-prize winner J. Schwinger suggests that sonoluminescence taps space energy (zero-point energy): Julian Schwinger (UCLA, Los Angeles), "Casimir Light: the Source," *Proc. Natl. Acad. Sci. USA*, vol 90, March 1993, pp 2105-2106.

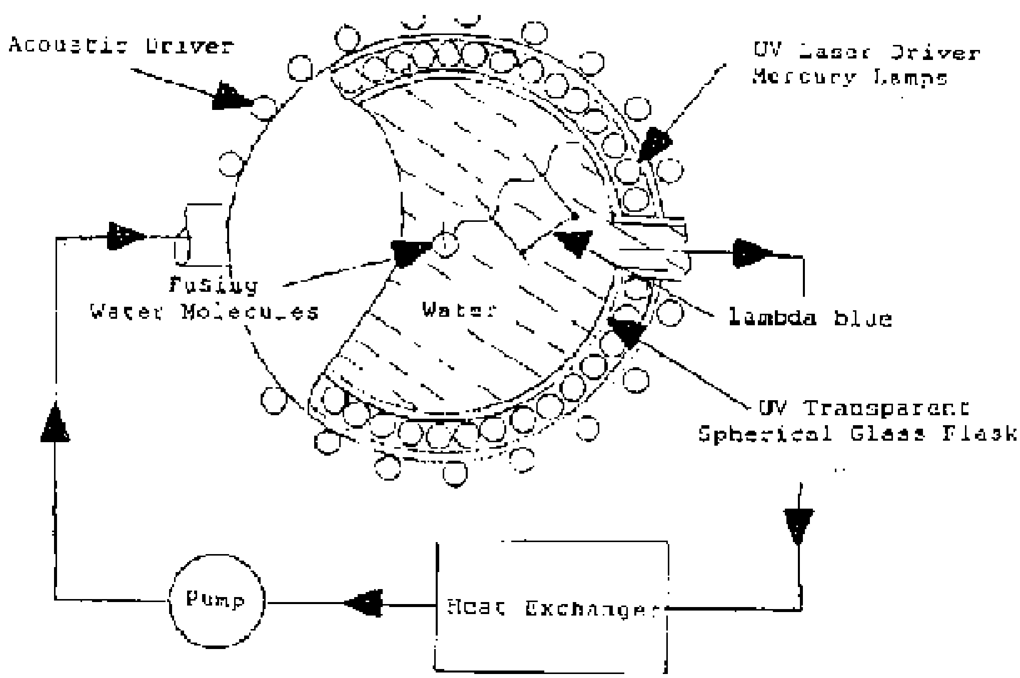

Fig. 1 Cold Fusion Blue Water Laser Concept

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