New Shot at Cold Fusion
By Pumping Sound Waves
Into Tiny Bubbles

New Fusion Recipe:
Sound Plus Bubbles

Fusion creates great energy but requires tremendous temperatures. A new approach that scientists hope might reach such temperatures, they are using minuscule bubbles as the focus for sound waves. With sound waves, a tiny heating element boils just enough water to create a single micron-sized bubble. A sound field makes the bubble pulse. As it expands, it absorbs sound energy. Then it suddenly collapses, launching a spherical, inward-moving supersonic shock wave, which produces enormous temperatures and a flash of light.

By MALCOLM W. BROWN

Ever since the first hydrogen bomb was detonated in 1952, scientists have sought to harness thermonuclear fusion as a peaceful power source, but that goal has proved tantalizingly elusive. Now, however, there seems to be an outside chance that a wholly new technique could achieve it. Bombarding microscopic bubbles with intense sound waves could convert the bubbles into minuscule fusion furnaces.

Recent experiments by a half-dozen laboratories suggest that a mysterious phenomenon called sound nuclear fusion may be capable of raising the temperature of gas trapped in a tiny bubble to 1.5 million degrees Fahrenheit or more — enough, in principle, to ignite fusion.

If fusion were achieved, a microbubble could be expected to release enormous, nuclear particles produced by thermonuclear reactions. So far, the laboratories experimenting with sound nuclear fusion have failed to detect any neutrons, but there are other signs that the project is far from hopeless.

In the 1950's German physicists discovered that when intense sound waves vibrating at a fixed frequency are blasted into a liquid filled with tiny bubbles, the stressed bubbles implode in a flash of light and startlingly high temperatures.

...bubbles oscillate, collapse and emit flashes of light. In the decades since the discovery of sound nuclear fusion, physicists have occasionally experimented with the phenomenon, but only in recent years have many of the most startling characteristics of sound nuclear fusion come to light.

In 1967, a research group led by Dr. Kenneth S. Suslick, a chemist at the University of Illinois in Champaign-Urbana, created clouds of sound waves in a bubbling bath of liquid deuterium. The hydrogen atoms in deuterium have a mass about 6 times that of normal hydrogen. By measuring the colors of the spectrum of light emitted by the bubbles, Dr. Suslick calculated that the gas in the bubbles had a temperature of about 8,000 degrees Fahrenheit, a startlingly high temperature, considering that the surrounding liquid had not appeared to be heated at all.

Dr. Suslick's group created clouds of light-emitting bubbles by a process called cavitation, simply by exposing fluids to intense sound waves. — a transporting environment of small droplets of bubbles (little bubbles) surrounding the fluid. In a typical reaction, the sound waves, Dr. Suslick found, bubbles formed and collapsed at a rate of several million times a second.

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Recent experiments by half-dozen laboratories suggest that a mysterious phenomenon called zonal oscillations may be capable of raising the temperature of gas trapped in a tiny bubble to 1.5 million degrees Fahrenheit or more—enough, in principle, to ignite fusion.

If fusion were achieved, a microbubble could be expected to release enough energy to power a nuclear reactor. So far, the laboratories experimenting with zonal oscillations have failed to detect any neutrons, but there are other signs that the project is far from hopeless.

In the 1960s German physicists discovered that when intense sound waves vibrating at a fixed frequency are passed into a liquid filled with tiny bubbles, the bubbles oscillate, collapse and emit flashes of light. In the decades since the discovery of zonal oscillations, physicists have occasionally experimented with the phenomenon, but only in recent years have many of the most startling characteristics of zonal oscillations come to light.

In 1997, a research group led by Dr. Kenneth S. Suslick, a chemist at the University of Illinois in Champaign-Urbana, created clouds of zonal oscillation bubbles in a bath of liquid decahydronaphthalene, a hydrocarbon solvent similar to gasoline. By monitoring the colors of the spectrum of light emitted by the bubbles, Dr. Suslick calculated that the gas in the bubbles had to be at a temperature of about 8,000 degrees Fahrenheit, a startlingly high temperature, considering that the surrounding liquid did not appear to be heated at all.

Dr. Suslick's group created clouds of light-emitting bubbles by a process called cavitation, simply by exposing fluid to intense sound fields—"fields" being permissive environments of sound created by transducers (small horn-shaped devices) surrounding the fluid. In a typical reaction flask, Dr. Suslick found, bubbles formed and collapsed at a rate of several millions a second.

At the University of California in Los Angeles, a team of physicists headed by Dr. Seth J. Putnam began the work reported in Science Times in which they sought to use sound waves to trigger fusion by heating tiny bubbles of deuterium, the heavier isotope of hydrogen, to the required temperature of millions of degrees Fahrenheit.

Source: Dr. Seth J. Putnam, UCLA

[Diagram of bubble chamber with sound waves and acoustic transducer]