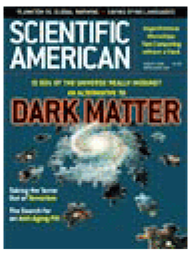
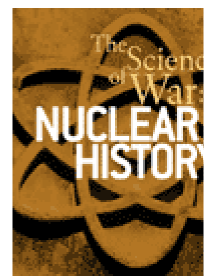
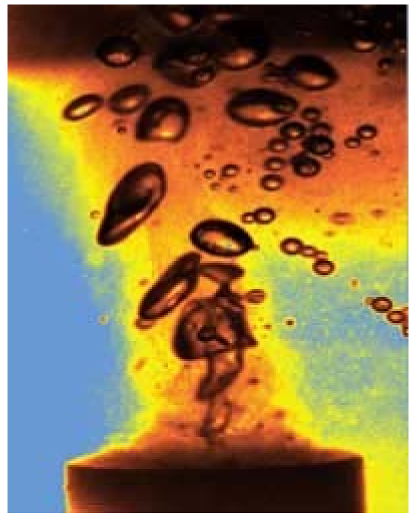




NEWS

July 25, 2002

New Bubble Reaction Findings Make Fusion Claims Unlikely



K. S. SUSLICK AND K. J. KOLBECK, *University of Illinois*

Sonoluminescence, the process in which light is created when sound waves move through a liquid and cause bubbles to expand and collapse, was at the center of a contentious scientific debate earlier this year. A team of researchers reported that they had exploited the phenomenon to achieve nuclear fusion using a tabletop apparatus, an assertion that quickly met with skepticism. Now new research casts further doubt on those claims. According to a report published today in the journal *Nature,* scientists have directly measured the reaction rates inside a single bubble as it sonoluminesces and the findings suggest so-called bubble fusion is "most unlikely."

Yuri T. Didenko and Kenneth S. Suslick of the University of Illinois at Urbana-Champaign studied single bubbles in water subjected to ultrasound and, for the first time, established an energy inventory for the collapsing spheres. The team calculated that most of the sonic energy is converted into mechanical energy, which creates motion in the liquid surrounding the bubble. Less than one millionth of the sound energy gets converted into light and one thousand times that amount powers chemical reactions occurring within the sacs. Specifically, the scientists measured the yields of hydroxyl radicals and nitrite ions produced by the so-called acoustic cavitation of the bubbles. Because energy is required to power these chemical transformations, there is less available to raise the temperatures inside the bubble to the intensity required for nuclear fusion to occur. "Some researchers have suggested that conditions within a cavitating bubble might be hot enough and have high enough pressure to generate nuclear fusion," Suslick says. "But we've shown that chemistry occurs within a collapsing bubble, and that it limits the energy available during the cavitation." He adds, however, that bubbles in certain liquids, such as molten salts or liquid metals, could conceivably reach the sky-high temperatures required for fusion to occur and the possibility of sonofusion "cannot be ruled out at this time."

In an accompanying commentary, Detlef Lohse of the University of Twente in the Netherlands writes that "although fusion may be out of reach, there are other uses for sonoluminescent bubbles." In particular, he notes that because the temperatures within the bubbles approximate those on the surface of the sun and the pressures are as high as those near the bottom of the ocean, the bubbles could be used as controlled high-temperature reaction chambers to study reaction rates under extreme conditions. --*Sarah Graham*

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