Journal Nature Refuses Explanation Light From Crushing Crystals Occurs At Ambient Temperature

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Controversial theory that sonoluminescence at ambient temperature also explains the light from crushing ordinary sugar cubes is rejected in favor of the light being produced at millions of degrees

The *Nature* Manuscript 2007-01-00903 refused for publication reads as folows.

In the *Nature* article [1] the similarity of emission spectra with sonoluminescence (SL) prompted the proposal that shockwaves are the source of mehanoluminescence (ML), or light from the crushing of crystals.

In SL, shockwaves are thought to accompany temperatures of thousands of degrees and pressures of hundreds of atmospheres during bubble collapse. But shockwaves in SL are the result of computations that gave temperatures of millions of degrees on the assumption the water vapor does not condense. Later, simulations of condensation assuming accommodation coefficients [2] from 0.2 to 0.3 gave temperatures from 5000 to 20000 K.

However, the bubble gas temperature [3] is very sensitive to the condensation coefficient. For a coefficient of unity, the simulations [4] show temperatures and pressures to remain near ambient during collapse. Although shockwaves do occur in SL as bubble walls collide, there are no shock waves in SL bubble gases to explain similar ML spectra.

Spectra are presented [1] for the sonication of slurries of sucrose in dodecane and resorcinol in hexadecane with nitrogen and helium sparges. However, SL spectra for dodecane and hexadecane with sparge gases and without sucrose and resorcinol that likely to show the strong effect of sparge gases are not presented. Regardless, the spectra unequivocally show nitrogen is excited in the crushing of *both* sucrose and resorcinol. The gigantic response shown for sonication of resorcinol in helium is likely that of nitrogen contamination.

Although the similarity of SL and ML spectra prompted the claim [1] that ML is caused by shockwaves thought to occur in SL, the similarity shows the converse is more likely - that SL is caused by voids that characterize ML. One such light emission mechanism [3] is the trapping of EM radiation in voids, say in ML as cracks open and close, or in SL as bubbles nucleate and collapse.

[1] Endingsaas, N. C. & Suslick, K. S. Nature Vol. 444, 163 (2006).
[2] The accommodation coefficient is defined as the probability that a water vapor molecule sticks to the bubble wall, and is required to be unity, as it must for vapor condensing inside a bubble.
[3] Prevenslik, T. V. “Sonoluminescence at Ambient Temperature?” www.geocities.com/sonoluminescence2004/SLrev4.PDF
[4] Prevenslik, T. V. Ultrasonics Vol. 41, 312 (2003).

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