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Single-bubble Acoustic Cavitation in Inorganic Liquids DAVID FLANNIGAN, KENNETH SUSLICK, Department of Chemistry, University of Illinois at Urbana-Champaign — We have discovered that single-bubble sonoluminescence (SBSL) from concentrated aqueous solutions of the mineral acids, especially sulfuric acid (H_2SO_4), can be made to be over 10^3 times brighter than SBSL from pure water. In addition, we have observed intense and well-resolved line emission within the SBSL spectra arising from many different ions (e.g., Xe^+, Ar^+, O_2^+), atoms (e.g., Ar, Ne, H, O), and small molecules (e.g., N_2, SO, SO_2); the observation of monocationic emission lines provides the first definitive experimental evidence of plasma formation during SBSL. By studying the relative intensities of, for example, Ar atom emission lines observed in the SBSL spectra, we are able to measure observable emission temperatures in excess of 15,000 K and pressures approaching 1,000 bar. The temperatures determined from molecular emissions are lower, however, and do not exceed 5,000 K. This observation suggests the presence of a spatial temperature gradient within the bubble or a temporal dependence to the SBSL emissions.

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