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CONCENTRATION DEPENDENCE OF SINGLE BUBBLE SONOLUMINESCENCE THRESHOLD IN SULFURIC ACID

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Single Bubble Sonoluminescence (SBSL) is observed when an isolated gas bubble is acoustically trapped in a liquid and the bubble undergoes oscillations in synchrony with the applied acoustic field and produces sub nanosecond flashes as the bubble collapses. In this study, the behaviour of SBSL was experimentally investigated in sulphuric acid (H_2SO_4) of different concentrations, since the concentration dependence of formation of SBSL for a wide concentration range has not been studied so far in detail. The experimental setup consists of a spherical flask, an impedance matching circuit, and a data acquisition system. Before the host liquids are used for the experiment, they have to be degassed and dissolved with Ar since only a specific concentration of Ar need to be present in the liquid for obtaining SBSL. Then the host liquid resonator was acoustically driven in the resonance frequency which is in the range of 24.1 - 28.0 kHz for different solutions. Next, the intensity of the sound wave was changed until SBSL was observed. Photomultiplier tube (PMT) and spectroscopic data were recorded for the temperature range of 15 – 40 °C. The SBSL bubble in 98, 85 and 65 wt% concentrations was stable for a wider temperature range. The stable SBSL emission for 58, 50 and 40 wt% concentrations was obtained only up to 30 °C. The SBSL bubble in 65 wt% H_2SO_4 was stable for the entire temperature range. It was found that the maximum SL radiation is observed from the solution of 98 wt% of H_2SO_4 for the entire temperature and concentration ranges. It is possible to predict that the temperature independence of SBSL can be expected in the region between 58 - 65 wt%. It was also found that UV contribution of SBSL spectrum is high for the concentrations less than 58 wt% of H_2SO_4 while visible and IR contributions are high for the concentrations higher than 65 wt% of H_2SO_4.

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