



THE COMPARISON OF SINGLE BUBBLE SONOLUMINESCENCE IN 40 WT% SELENIC AND SULFURIC ACIDS

Herath P.S.* and Nanayakkara A.

Physical and Computational Sciences Division,
National Institute of Fundamental Studies, Kandy, Sri Lanka prabhathsanjeewa@gmail.com

Abstract

Single Bubble Sonoluminescence (SBSL) is observed when an isolated gas bubble is acoustically trapped in a liquid and the bubble undergoes oscillations and produces sub-nanosecond flashes as the bubble collapses. In this study, we investigated the behaviour of SBSL in 40 wt% sulphuric acid (H_2SO_4) and 40 wt% selenic acid (H_2SeO_4) and compared them. The major reason for choosing 40 wt% concentrations of these acids is that the highest concentration of H_2SeO_4 commercially available is 40 wt%. The experimental setup consists of a spherical flask, an impedance matching circuit, and a spectral acquisition system. Before 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. The H_2SO_4 was first degassed by purging with Ar under atmospheric pressure for 12 hours and then vacuuming under 30 Torr for another 12 hours. We repeated this degassing and regassing procedure for two days. The same procedure was repeated for preparing H_2SeO_4 . After preparing the host liquid, it was transferred into the flask and then resonance frequency was obtained. Obtained resonance frequencies are 24.1 kHz and 26.0 kHz at 15 °C for H_2SO_4 and H_2SeO_4 , respectively. Next, the intensity of the sound wave was changed until SBSL was observed. The PMT and the spectral data were recorded for SBSL in H_2SeO_4 for 4 different temperatures and repeated the experiment for H_2SO_4 . It was found that the H_2SeO_4 has higher intensities for the entire temperature range compared to H_2SO_4 . At lower temperatures, the spectrum of SBSL for both acids trends towards the UV region. As the temperature has increased the intensity is reduced and the peak value is shifted towards the visible region, indicating the higher stability of the bubble at lower temperatures.

Keywords: Sonoluminescence, spectrum, acoustic, resonance, electrical