# Influence of He and Ar flowrate and NaCl concentration on the size distribution of bubbles generated by power ultrasound

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# *Topic of Abstract*

| Fundamentals | |
|---|---|
| Sonoluminescence | ☒ |
| Bubble Dynamics | ☐ |
| Reaction Mechanisms | ☐ |
| Reactors and Equipment | ☐ |

| Applications | |
|---|---|
| Cleaning | ☐ |
| Materials and Synthesis | ☐ |
| Food Chemistry and Bioprocessing | ☐ |
| Catalysis | ☐ |
| Water and Wastewater Remediation | ☐ |
| Therapeutic Ultrasound | ☐ |

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*Pflieger R.*

# *Type of Presentation*

| | |
|---|---|
| Oral (standard) | ☒ |
| Plenary | ☐ |
| Keynote | ☐ |
| Poster | ☐ |
| Exhibition | ☐ |

# Influence of He and Ar Flowrate and NaCl Concentration on the Size Distribution of Bubbles Generated by Power Ultrasound

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In sonochemistry, bubble size and bubble size distribution are key parameters that influence the chemical activity of the system, the dynamics of the bubbles etc. Besides, they are input parameters in most equations describing acoustic cavitation. Therefore several methods have been developed to measure the bubble size distribution, for instance by laser diffraction[1] or by measuring the dissolution time of sonoluminescence or sonochemically active bubbles under pulsed ultrasound.[2]

The main parameters that affect the bubble size distribution are basically the same as those that affect the sonochemical activity: the nature of solvent and dissolved gas, solution temperature, presence of electrolytes, etc.[3] Understanding the effect of electrolytes is of particular importance, since they are of concern in most real sonochemical reactions. In addition, the concentration of dissolved gases is significantly affected by the amount of dissolved electrolytes in aqueous solutions, which in turn may control the extent of coalescence and the size of bubbles.

In this work,[4] a technique based on pulsed ultrasound and sonoluminescence emission was used to measure the size and size distribution of bubbles generated by 355 kHz power ultrasound under continuous Ar or He flow in aqueous NaCl solutions. It was observed that the bubble size strongly decreased with increasing NaCl concentration (Fig. 1) and that this decrease was much stronger than in solutions pre-saturated with Ar or He. Thus, the dissolved gas concentration, controlled by the salt concentration, is not the only parameter that governs coalescence and the bubble size, but other parameters also play an important role. In particular, the presence of continuous bubbling – that is characteristic of many real sonochemical systems - appears to decrease the bubble size by introducing more bubble nuclei. Besides, the gas diffusion coefficient also appears to be a major parameter in the definition of the bubble size: when the gas solubility is high enough a high gas diffusion coefficient leads to the formation of bigger bubbles due to faster growth in each expansion cycle. This study thus opens perspectives on new parameters that would affect the sonochemical activity. Indeed, while a smaller bubble size should a priori lead to lower sonochemical activity per bubble, the effect of continuous gas bubbling may counterbalance this effect by the introduction of more bubble nuclei and subsequent higher number of active bubbles.

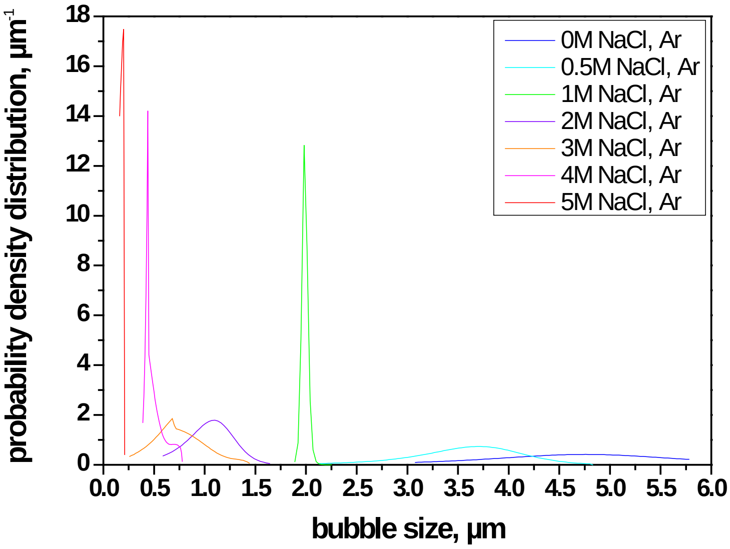


**Figure 1.** Bubble size distribution as a function of NaCl concentration in water under Ar bubbling. The uncertainty is estimated to be about 0.1 µm.

**References (Times New Roman, 10 pt)**

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