

Analysis of the concentration dependence of ultrasonic cavitation in suspensions by considering particle analysis and particle manipulation factors.

Summary

In our experiments we studied how the qualitative and quantitative properties of water based suspensions effect the occurrence and threshold levels of the ultrasonic phenomena, standing wave, acoustic streaming and especially cavitation. In our experiments commercial pressed (hydrated) and lyophilized (dehydrated) baker's yeast (*Saccharomyces cerevisiae*), and a dolomite suspension that has the same average particle size as of the yeast were used. The experiments were conducted in the ultrasonic treating vessel under the conditions of 1.117 [MHz] frequency and 0-12 [W/cm²] ultrasound output. We examined the levels of particle concentration [g/l] in the ultrasound field that were needed to terminate cavitation (that is the cavitation threshold concentration), and we measured the length of time that passed from the start of the experiment until the restart of cavitation, which is the time period required for the formation of cavitation. These experiments were carried out under concentration levels that were 1.5 times higher than the cavitation threshold concentrations. The acoustic phenomena taking place in the ultrasound field, and through these, the effects of ultrasound can be characterized by these two measures. This study is suitable for further expanding the application area of ultrasound towards particle analysis, selective particle manipulation, biological extraction, cell inactivation and fermentation techniques.

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Keywords: Ultrasound field, Acoustic phenomenon, Cavitation threshold, Suspended particles, Concentration
