Use of a high density, low temperature, bubble column for thermally efficient water sterilization

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ABSTRACT

An unusual property of salt water, that is its ability to inhibit air bubble coalescence, has been used as the basis for a new method of water sterilization. In this process, high-temperature gas is passed through a porous sinter into a contaminated aqueous solution containing at least 0.15 M NaCl, to prevent bubble coalescence. It is found that even at high gas temperatures, the presence of salt still inhibits bubble coalescence and hence high bubble volume fractions of small bubbles can be attained, which is shown to improve the efficiency of the sterilization process. It has been established that the continuous flow of hot (dry) gases, even at 150°C, only heat the aqueous solution to about 45°C, which is an ideal temperature for bacterial colony growth in typical contaminated water. Hence, it has been established that sterilization occurs due to the transient collision of biological species with the hot gas bubbles. This new method has a significantly improved energy efficiency over the standard process of sterilization of boiling the contaminated water for 5-30 min, as typically recommended.

Keywords: Thermal sterilization; Non-boiling sterilization; Bubble coalescence; High-density bubble column

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