

The Influence of Salt Addition to the Disinfection Process Using Ultrasonically Generated Ozone Microbubbles

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Summary

An ozone oxidation is widely used for the water disinfection since it has powerful oxidation ability. In general, an ozone disinfection treatment is performed by bubbling an ozone gas through disperser into water. However, a solubility of ozone in water is low, the ozone disinfection treatment needs long contact time or complicated contactor for an ozone dissolution into water.

Meanwhile, microbubbles with diameters less than 100 μm are receiving attention because of their properties such as large surface area per unit volume, low rising velocity, and self-pressurization due to surface tension. Therefore, we developed a new disinfection treatment using ozone microbubbles generated by the hollow ultrasonic horn (US μ B treatment). US μ B treatment has higher disinfection ability to *Escherichia coli* than conventional treatments such as treatment with ozone bubbles generated by the porous gas disperser (MB treatment), treatment with ultrasonic irradiation to test sample (US treatment), and treatment with ozone bubbles generated by the porous gas disperser and ultrasonic irradiation (MB+US treatment).

The treatment using the ozone microbubbles generated by the hollow ultrasonic horn has high disinfection ability, however, this treatment cannot inhibit bacterial growth because ozone itself decomposed in water and changed to oxygen. Thus, we added salt to the US μ B treatment for inhibiting bacterial growth. We investigated the disinfection abilities of US μ B treatments in pure water, 1% NaCl aqueous solution and 3% NaCl aqueous solution. These experimental results revealed that US μ B treatment in NaCl aqueous solution has higher disinfection ability than that in pure water and NaCl concentration increasing enhances the disinfection ability. The enhancement of disinfection ability by NaCl addition is caused by the increase of ozone dissolution rate since the diameter distribution of microbubbles generated in NaCl aqueous solution is smaller than that of the microbubbles generated in pure water. In addition, 3% NaCl aqueous solution could inhibit bacterial growth within 48 hours while 1% NaCl aqueous solution could not inhibit bacterial growth because osmotic pressure of 1% NaCl aqueous solution is approximately same as those of *Escherichia coli*.