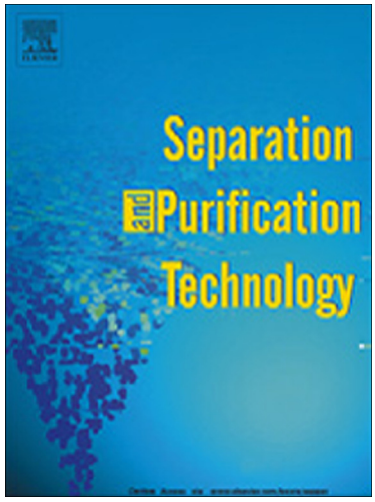

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Decomposition of chloroform and succinic acid by ozonation in a suction-cavitation system: Effects of gas flow

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ABSTRACT

The conductivity of aqueous solutions containing 1 mM chloroform increases upon the chloroform decomposition that is induced by hydrodynamic cavitation in the suction-cavitation system. However, the rate of increase in conductivity (RIC) drops significantly, from 1.314 μS cm^{-1} min^{-1} without gas flow to 0.552 μS cm^{-1} min^{-1} with 25 mL min^{-1} of air flow. The RIC decreases further with increasing air flow, until pseudo-zero growth is reached at 200 mL min^{-1} air flow. Introducing O_3 at 33 mL min^{-1} gas flow (effective cavitation) improves RIC, from 0.4193 to 0.5509 μS cm^{-1} min^{-1}, but the enhanced rate (31.4%) is lower than at 200 mL min^{-1} of gas flow (little effective cavitation). The concentrations of dissolved O_2, O_3 and H_2O_2, that is formed on-site, increase with increasing gas flow and orifice plate hole diameter. Succinic acid (0.42 mM) is not oxidized by O_3 or H_2O_2 alone, but is rapidly degraded by a combination of O_3/H_2O_2 in the suction-cavitation system. The degradation rate of zero-order kinetics increases from 2.604 to 4.788 μM min^{-1} as orifice diameter increases from 5 to 8 mm. Increasing O_3 gas flow and temperature favour SA degradation. Increasing H_2O_2 concentration is more effective in producing OH radicals and promoting the oxidation of succinic acid than increasing O_3 input amount.

Keywords: Chloroform; Succinic acid; Decomposition; Ozonation; Hydrodynamic cavitation.