Accepted Manuscript

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PII: S1350-4177(18)30156-1
DOI: https://doi.org/10.1016/j.ultsonch.2018.05.015
Reference: ULTSON 4173

To appear in: *Ultrasonics Sonochemistry*

Received Date: 1 February 2018
Revised Date: 4 May 2018
Accepted Date: 16 May 2018

Please cite this article as: L.M. Cerecedo, C. Dopazo, R. Gomez-Lus, Water disinfection by hydrodynamic cavitation in a rotor-stator device, *Ultrasonics Sonochemistry* (2018), doi: https://doi.org/10.1016/j.ultsonch.2018.05.015

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Water disinfection by hydrodynamic cavitation in a rotor-stator device

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Abstract

The efficiency of a rotor-stator device for water disinfection based on hydrodynamic cavitation is investigated. Water is infected with *E.coli* and *E.faecalis* with initial concentrations in the range $5\text{x}10^2 - 1.2\text{x}10^6$ CFU/ml. Various geometries of the cavitation channel between rotor and stator are tested, achieving bacterial annihilation in less than 10 minutes of treatment times. Microorganism permanent elimination is verified via micro-seeding to discard viable non-culturable bacteria; micro-seeding was done for those samples displaying no CFU growth via normalized cultures on a Petri dish. TEM photographs are analyzed and the extent of bacterial damages is tentatively correlated with the various cavitation mechanisms. Rotor-stator cavitation assemblies used in the current research are between one and two orders of magnitude more energy efficient than those tested by other investigators. Acoustic pressure spectra are measured to assess the implosion intensity. Parametric analyses are conducted changing the rotor diameter (110-155 mm), the cavitation channel contraction ratio, A_{max}/A_{min} $(4.56 - 5.0)$, and the number of contractions (N_r: $58 - 80$ rotor vanes; N_s: $8 - 16$ stator vanes).

Keywords: Hydrodynamic Cavitation, Water Disinfection, *E.coli*, *E.faecalis*

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