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## COMPARISON OF UNDERWATER ELECTRICAL DISCHARGE PROCESSES FOR THE INACTIVATION OF *Escherichia coli*

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### Abstract

The inactivation of *Escherichia coli* was investigated with two types of underwater electrical discharge systems such as pulsed electrical discharge (PED) and dielectric barrier discharge (DBD). The DBD system consisted of a quartz tube and a coaxial discharging electrode, which was submerged in biologically contaminated water. In the underwater PED system, the electrical discharge starting from the tip of submerged tubular discharging electrode propagated downward and the direction of working gas injected through the discharging electrode was also downward. The inactivation performances of the underwater electrical discharge systems were comparatively examined with experimental variables including working gas type, the mode of operation, electrical energy and treatment time. With air or oxygen as a working gas, the DBD system showed much better inactivation performance than the PED system, but with nitrogen the PED system was superior, suggesting that these two types of underwater electrical discharge systems are different in dominant inactivation mechanisms. The inactivation by the DBD could be best characterized by the ozonation, and the contribution of the UV irradiation was minor. An operation at lower electric power (the DBD case) or at lower pulse repetition rate (the PED case) consumed less electrical energy for the inactivation, but it required longer inactivation time.

**Key words:** dielectric barrier discharge, *Escherichia coli*, inactivation, pulsed electrical discharge

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