

Disinfection of *Escherichia coli* and *Bacillus subtilis* using underwater plasma

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Discharge under the water is very hard and demand considerable high voltage. But specially improved electrode can generate plasma discharge to salty water with relatively low voltage.

A round shape ceramic electrode having many pinholes combined with metallic one can generate plasma. 400 volt, 10 kHz and 3 micro second pulse width were applied to repeatedly running synthetic seawater with 10 L/m velocity, containing cultivated *E. coli* and *Bacillus*.

As a result, 18, 94, 99.97, 100, 100 % disinfection rates to *E. coli* and 17.1, 17.1, 82.9, 99.4, 99.9 % disinfection rates to *Bacillus subtilis* were achieved to 1, 2, 3, 4, 5 times repetitive treatment respectively.

In the plasma condition, the ions and electrons are separated and new kinds of components are re-synthesized by the intensive movement of the components. Especially chlorine ions are separated and recombined to residual free chlorine like HOCl, OCl⁻. The residual free chlorine concentrations of discharged water were 0.25, 0.88, 1.39, 1.59, 1.66 mg Cl₂/L after 5 times treatment respectively. Another unconfirmed radical and oxidants for example, OH, H₂O₂, and O₃ can have an effect on microorganism of course.