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PULSED PLASMA TREATMENT OF SURFACE WATER USING LOW-TEMPERATURE CORONA REACTOR

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Abstract

The disinfection of water containing microorganisms by exposure to pulsed-discharge plasma using a low-temperature gas-liquid hybrid discharge (HD) reactor was studied.
The HD reactor consists of a plexiglas cylinder containing the liquid of high voltage electrode above liquid's surface and grounded electrode submerged in the liquid. The HD could produce both arc discharges in gas and liquid phases. The high-energy plasma arc produces a pressure shock wave, which kills the targeted microorganisms by causing physical damage to their cellular matrix either by the sudden recoil of the cell or by the micro-eddies created on the internal cell structure. The water sample (from river Nile) was divided equally into two samples: the unexposed control (witness) sample and the tested sample, which was exposed to a number of pulses of corona discharge treatment system. The water samples were analyzed bacteriologically. The water contains some pathogenic microorganisms including Heterotrophic Plate Count (HPC) (formerly known as Standard Plate Count) greater than 100 CFU/mL in the water sample before treatment and no one after treatment. Also, coliform bacilli were evaluated, the most probable number in the sample being greater than +180 coliform bacilli/100mL before treatment and no coliform bacilli after treatment. There were no found *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Escherichia coli* in the water sample before and after treatment. Therefore, it is necessary to disinfect the water before using it for drinking and industrial applications to ensure the safety and purity of water.

Key words: bacteriology, corona discharge, microorganisms, shock wave