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The Improvement of Energy Efficiency by Generating Hydroxyl Radical on the Surface of Droplets for the Water Treatment Using Pulsed Power Discharge

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Pulsed power discharge in water has been investigated as one of advanced water treatment technologies. Pulsed power discharge in water generates many active species (ozone, OH radical, ultraviolet rays etc.). All of them could be utilized to the decomposition of organic substances in water. However, since the lifetime of OH radical is short, there is a problem that it reacts and disappears before reacting to the substances.

Therefore we are studying the water treatment method utilizing OH radical efficiently. The feature of our system is that contaminated water is sprayed as droplets from the top into the reactor that generates pulsed plasma in the gas phase. Contaminated water reacts with active species in the streamer discharge directly. Hence this method has so much high efficiency for the water treatment [1]. However, since OH radical that has short lifetime is generated near the streamer, some OH radicals would react before the reaction to the droplets.

In this study, we designed a new reactor that the pulsed discharge occurs on the surface of the water droplets. By this design, it has been observed to improve the energy efficiency for water treatment. In other words, it is possible to decompose the organic substances in water with less energy and to come faster treatment.

References:

[1] Malik, M. A., Water Purification by Plasmas: Which Reactors are Most Energy Efficient?, Plasma Chem. Plasma Process, Vol. 30(1), 21-31 (2010)

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