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Effect of the Number of Inner Wire Electrodes on Surfactant Treatment Using Nanosecond Pulsed Powers

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Recently, water pollution has come to an issue around the world. As a new water treatment technology, advanced oxidation processes (AOPs) has attracted attention. We have studied an efficient wastewater treatment using nanosecond pulsed power as one of the AOPs. In this system, effects of not only the active species but also electric discharges are expected. A nonionic surfactant was selected as a treatment target because much nonionic surfactant occupies to domestic and industrial wastewater. The surfactant solution was circulated in a water treatment equipment with a coaxial cylindrical reactor by a pump. In previous research, 0.5 L of surfactant solution was mostly treated for 120 minutes using the nanosecond pulsed power system.
In order to shorten the treatment time and increase the treating capacity, another treatment system was developed. The number of inner wire electrodes was increased from one to eight. In addition, internal diameter of the outer electrode became larger. As a result, the treatment time of 1.0 L surfactant solution became shortened to 80 minutes. The treatment by reactor having the eight inner electrodes was compared with that having two inner electrodes. Although both foam heights in water reservoir were approximately same after 80-minutes treatment, UV absorption of the solution treated by using eight inner electrodes were larger than using two inner electrodes over the observed spectrum. It seemed that the increase of UV absorbance was caused by more amount of active species dissolved in the solution because more ozone was also produced. In addition, increase of interfacial area between the solution and streamer discharges was expected. Therefore, molecular structure of hydrophilic group of surfactant treated by using eight inner wire electrodes could be decomposed into smaller structure.

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