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論　文　内　容　の　要　旨
Abstract of Dissertation

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Pulsed power technology has been being researched and developed from last century. From the theorical concept of pulsed power technology, the same amount of electric power can be released with very short duration when compared with the original duration. There are some ways to generate the pulsed power, such as compressing power, which can generate pulsed power by compressing electric power and releasing the same amount of this electric power in shorter time. There is also a different way to generate pulsed power by adding plenty of low electric power together and releasing the sum of added electric power in the same duration. There are a lot of generators that can generate pulsed power efficiently, such as MARX or Linear Transformer Driver (LTD). Besides with the research of improving the performance of pulsed power generator, a lot of studies have been done on the application of pulsed power technology. At the present, pulsed power technology has been being applied in a lot of fields. As one of the applications of pulsed power technology, water treatment based on pulsed discharge has been studied for decades. As a result, active species (ozone, OH radical) produced by pulsed discharge have been considered as effective element for treating harmful chemical in water. And the study of this dissertation focuses on the effect of pulsed discharge on producing these active species (ozone, OH radical) to investigate the way to improve the production of active species for water treatment application by pulsed discharge.

Firstly, evaluation effect of the characteristic of pulsed discharge on ozone production in atmospheric pressure has been done. Linear Transformer Driver (LTD) system was used to generate electric pulse for all experiments. In order to investigate effect of the voltage in the last half of pulse on production of ozone, pulse with waveform of lowered voltage in the last half of pulse has been applied for evaluate efficiency of ozone production. The average total input energy has been maintained as unchanged when different waveform was applied. As a result of the experiment, the concentration and energy efficiency of ozone production can be improved with lessening voltage at the last half of pulse. The neutralization of ion when the primary streamer head has already gone to the ground lead to the decrease of electric field in this phase and difficulty in ozone production, which may be considered as physical reason for this phenomenon.

Next, interval between two pulse was investigated for its effect on ozone production. Pulse interval with value varied from 1μs to 10ms was applied for evaluating ozone production. As the result, when the first pulse was applied to the electrodes in water treatment system, and the second pulse was applied after more later time, the concentration and energy efficiency of ozone production can be increased. The reason is more occurrence of ozone decomposing reaction released by shorter pulse interval.

In the next part of this study, pulsed discharge was investigated for its effect on OH radical production. Pulse waveform of lowered voltage at the latter half was applied to evaluate OH radical

production. The average input energy of pulse per one unit of time was also maintained as unchanged for all experiments in this part. From the experiments, it can be confirmed that amount and energy efficiency of OH radical production can be improved with elimination voltage at the latter half of pulse. As the reason mentioned above for ozone production, the decrease of electric field in the later half phase affected by ion neutralization may be the reason for difficulty in OH radical production in this phase.

Finally, evaluation of OH radical production of only the last phase of pulsed discharge was done to investigate effect of electric field on OH radical production in only the last phase of pulsed discharge. More voltage was added up to the last half of pulse and the OH radical production in only the last phase of pulsed discharge was analyzed. It can be concluded from the experimental results that when the strength of electric field in the last phase is increased, the amount and energy efficiency of OH radical production in this phase can be improved.