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Observation of Discharges in NOx Treatment Reactor Using Nanosecond Pulsed Powers and the Reactor Improvement

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In recent years, environmental problems as acid rain and air pollution have become more serious. Nitrogen oxides (NOx) are one of causative agents of them. Currently, NOx treatment technology has been established, but they have some disadvantages as high cost and large-sized equipment. Because the NOx treatment equipment did not become widespread, there is a need in the art for a cost-effective and compact NOx treatment system. We have studied the NOx treatment by a nanosecond pulsed power. Streamer discharges are produced in the treatment reactor by adopting nanosecond pulsed power and effective NOx treatments are expected as a result. In the previous study, while NO removal ratio increased after start of the treatment, it decreased after the peaking. It is found that the decrease was caused by curvature of the inner wire electrode and occurrence of spark discharges in the treatment reactor. In a preliminary experiment, the phenomena were suppressed by a tensioned inner electrode by a weight. A tensioned inner electrode by a spring was introduced to control the phenomena and it improved the treatment efficiency in this study. In addition, appearance of discharges in the reactor was observed to consider a dependence of the discharge appearance on NOx treatment. The spark discharges was not observed and streamer discharges were produced uniformly and stably in using the spring system. As a result, the temporal decrease in removal ratio was not observed and the removal ratio was righted. The removal ratio was improved at each pulse repetition rate in using the spring system. When the initial NO concentration was 100 ppm, the removal ratio reached up to 100 %.

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