



Contribution ID: 161

Type: **Poster Presentation**

Improvement of Ozone Producing Coaxial Reactor by Tensioned Inner Wire Electrode in Using Nanosecond Pulsed Power

Friday, 8 July 2016 14:40 (20 minutes)

Ozone is a strong oxidizer and becomes low environmental load because ozone is composed of oxygen atoms. Therefore, ozone is expected to be utilized in many fields, and high concentrated and efficient ozone producing method is desired. Although the ozone production using dielectric barrier discharges is generally used because of obtaining high concentration, the production efficiency is not high in consideration of cooling energy for the system. In contrast, streamer discharges generated by pulsed power produce ozone with high efficiency but not high concentration.

Nanosecond pulsed power has been introduced to produce ozone efficiently and we attempted to increase concentration by adopting the thin coaxial reactor with short electrode separation. In previous studies, temporal downturn of ozone concentration was observed and the peak concentration was not maintained. Then, it was observed that the inner wire electrode curved and spark discharges frequently occurred around where the electrode gap narrowed. These phenomena were considered as a cause of decreasing ozone production. In this study, we experimented with two approaches to suppress these phenomena. One was an adoption of a thicker inner electrode. The diameter of the inner electrode was altered among 1, 8, and 14 mm as a preliminary experiment. Although the curvature of inner electrode was constrained, ozone concentration decreased. This would be because reduction of electric field strength on electrode surface decreased occurrence of streamer discharges. There is, however, a room of study because decreasing of ozone concentration was small in using 8-mm electrode. Another was an adoption of tensioned inner wire electrode by a spring. The curvature of inner electrode was constrained. As a result, the downturn of ozone concentration was not observed and the concentration increased in stable state. In addition, the effects of increasing number of reactors and the others will be discussed in presentation.

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Session Classification: Poster 3-A

Track Classification: Plasmas, Discharges, and Electromagnetic Phenomena