Ozone Synthesis in Oxygen Using a Pulsed Discharge

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Abstract

Ozone is a strong oxidizing and bleaching agent, which makes it a potent germicide, viricide and bactericide. Therefore, ozone can be used as an alternative to chlorination processes with low energy consumption and without detrimental effects to the environment. Ozone can be applied to numerous industrial applications including treatments of water, industrial wastes and removal of NO_x and SO_x from flue gases, bleaching processes, in the semiconductor industry and other applications. Therefore, it is necessary to investigate the effects of various parameters on the production of ozone both experimentally and by numerical simulation. A numerical simulation of the products created in oxygen which is widely used in the production of ozone and employing very short pulsed streamer discharges at atmospheric pressure was performed. A simulation has been made of the rate coefficients of various plasma chemical reactions including electron impact dissociation of molecular oxygen, which occurs in the streamer corona discharge as functions of the electric field and the ambient gas temperature in a wire-to-cylinder configuration. The influence on the production of ozone of a single pulse, multiple pulses, gas temperature and gas pressure have been investigated. This study was aimed at understanding the discharge phenomenon in an ozonizer after applying a short pulsed voltage for 100 ns in more details that could not be observed by experiments. The dependence of the concentration of ozone on the parameters studied, generally agreed with the trends of the experimental results and with the published literature thus confirming the validity of the simulation model.