PLASMA CHEMICAL REACTOR WARMING-UP

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Plasma chemistry is a rapidly developing branch of industry. One of the most important parameters of the balance of chemical reactions is the temperature of working gas [1]. To achieve an operating mode, a reactor must be preheated.

In this work, the measuring technique of warming a plasma chemical reactor based on a dielectric barrier discharge is presented. The plasma temperature in the reaction volume was determined by analyzing the profile of the N_2 0-0 337.13 nm spectral band using the Massive OES software package [2].

The plasma reactor consists of a quartz tube with an inner diameter of 7.6 mm and a wall thickness of 1 mm, inside which a high-voltage electrode with a diameter of 4 mm is located. The outer ring electrode is grounded via the measuring capacitor. The reactor is powered by the 25 kHz sinusoidal voltage with the peak-to-peak value of 12 kV. The air with the humidity of 95±5% at a temperature of 20 ^{o}C was passed through the discharge cell at a flow rate of 0.2 liters per minute. Description of plasma reactor was presented in [3]. The radiation of the barrier-discharge plasma was collected by a quartz lens into the optical fiber and recorded using an MS-257 LOT Oriel spectrograph with an Andor CCD 420-UV-FK camera.

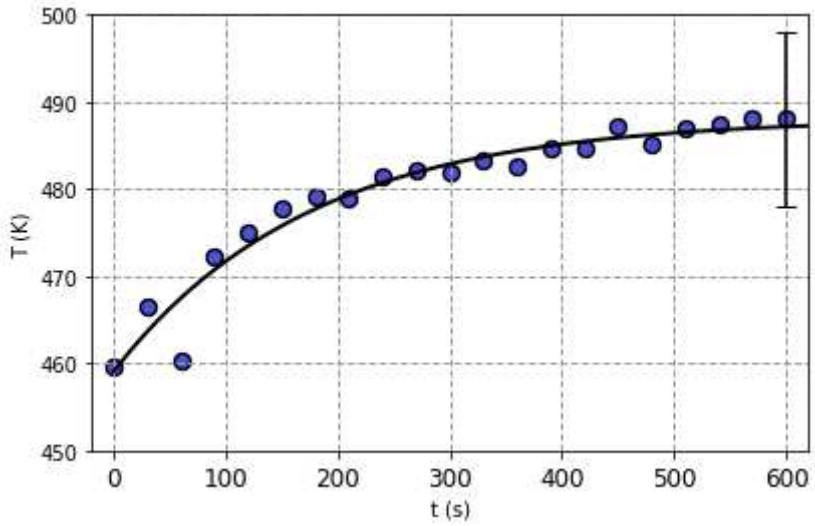

Fig.1. Rotational temperature for N_2 0-0 337.13 nm band vs time inside the reactor.

The time dependence of the rotational temperature of nitrogen molecules is shown in Fig. 1. The spectral determination of temperature corresponds to gas temperature inside the reactor. The rotational temperature obtained correlates with ozone and nitrogen oxides production.

REFERENCES

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