STUDY OF THE COMPONENT CONTENT OF ACTIVE PARTICLES IN BARRIER DISCHARGE IN WET (RH≈80%) AIR

I.A. Soloshenko, V.V. Tsiolko, V.Yu. Bazhenov, A.I. Shchedrin, A.V. Ryabtsev, S.S. Pogulay

Institute of Physics, Nat. Acad. Sci. of Ukraine
(*46, Nauky Prosp., Kyiv 03028, Ukraine;*
e-mail: poguly@iop.kiev.ua)

S u m m a r y

We present the results of experimental and theoretical studies of the component content of active particles in the volume barrier discharge in wet (RH≈80%) air. To describe the plasma kinetics, a new numerical model, in which the power introduced into a discharge gap is immediately averaged over the entire discharge volume, is proposed. The numerical dependences of the component content of particles formed in the discharge on the gas medium temperature, transient time of the gas mixture in a discharge gap, and specific power are obtained. The concentrations of O_3, HNO_3, and HNO_2 at specific power values of $W_d = 1.5$ and 0.75 W/cm^3 are measured experimentally. The rotational temperature of nitrogen molecules $T_{\rm rot}$ is measured as well. The comparison of experimental data with the results of calculations shows that the O_3 concentration is in quantitative agreement with the calculations, whereas the HNO_3 concentration exhibits just a qualitative agreement. Experimentally, the measured HNO_2 concentration essentially exceeds the theoretically calculated value. The main reasons for this discrepancy are presented. It is also shown that the experimental data are in better agreement with the calculations under the increase of both the specific power and the transient time of gas mixture in a discharge gap.