STUDY OF NON-ISOTHERMALITY OF ATMOSPHERIC PLASMA IN TRANSVERSE ARC DISCHARGE

I.V. Prysiazhnevych, V.Ya. Chernyak, V.V. Yukhymenko, V.V. Naumov[1], *Š. Matejčik*[2], *J.D. Skalny*[2], *M. Sabo*[2]

Taras Shevchenko Kyiv National University, Faculty of Radiophysics (*2/5, Academician Glushkov Ave., Kyiv 03127, Ukraine; e-mail: priv@ukr.net*),
[1]Institute of Fundamental Problems of High Technology, Nat. Acad. Sci. of Ukraine (*45, Nauka Ave., Kyiv 03680, Ukraine*),
[2]Comenius University, Department of Plasma Physics (*F-2, Mlynska dolina, Bratislava 84248, Slovakia*)

S u m m a r y

Properties of non-equilibrium plasma in the transverse arc discharge that occurs in air and argon jets at atmospheric pressure have been investigated by optical emission spectroscopy. The temperatures of population of excited electronic (T_e^*), vibrational (T_v^*), and rotational (T_v^*) states of molecular and atomic components in plasma have been determined, and their distributions along the gas flow have been studied. A high level of plasma non-isothermality, i.e. $T_r^* < T_v^* < T_e^*$, was found to be caused by different scales of characteristic times of elementary kinetic processes in the dynamic gas-discharge system. The revealed difference between the values of T_e^* for copper atoms CuI (the electrode material) and for oxygen OI, hydrogen HI, and argon ArI atoms (the components of a blowing gas) was explained by the availability of an additional electron-ion recombination mechanism of populating the excited electronic states of copper atoms, which is almost inactive for the atoms in the blowing gas.