IX SERBIAN CONFERENCE ON SPECTRAL LINE SHAPES IN ASTROPHYSICS
May 13-17, 2013, Banja Koviljača, Serbia
Book of Abstracts, Eds. L. Č. Popović, M. S. Dimitrijević, Z. Simić and M. Stalevski
Astronomical Observatory Belgrade, 2013

SPECTROSCOPY PECULIARITIES OF THERMAL ELECTRIC ARC DISCHARGE PLASMA BETWEEN COMPOSITE ELECTRODES Ag-SnO_2-ZnO

R. V. Semenyshyn, I. L. Babich, V. F. Boretskij and A. N. Veklich

National Taras Shevchenko University of Kyiv, Radiophysics Faculty, Volodymyrs'ka 64, 01033 Kyiv, Ukraine

E-mail: r.semenyshyn.ua@gmail.com, babich@univ.kiev.ua, boretskij@univ.kiev.ua, van@univ.kiev.ua

The wide application of composite materials in contacts or electrodes of switching devices in the electrical industry stimulate the growing interest in studying of plasma of electric arc discharges between electrodes produced from such kind materials. The composition optimization of an appropriate composite material is the problem of great importance at the moment. Therefore it seems reasonable to carry out the investigations of plasma parameters in a discharge gap with the aim to reach the perfect erosion properties of composite electrodes. Usually the determination of plasma parameters is performed by optical spectroscopy techniques in most cases. However the utilization of such methods is impossible without careful selection of emitted spectral lines and their spectroscopic data as well. This report deals with the experimental attempt to verify the atomic data of ZnI spectral lines, which one can find in the up-to-date data bases. The free burning arc between the composite Ag-SnO_2-ZnO electrodes was used as the thermal plasma source with zinc and silver vapours at the first stage. We carefully selected just those data of ZnI lines, which were in line with the same slope of the populations of AgI lines in the Boltzmann plot in an assumption of local thermodynamic equilibrium. The previously selection of silver spectral lines and atomic data was carried out. At the next stage of investigation the free burning electric arc between the brass electrodes was used as the thermal plasma source with zinc and copper vapours to verify the obtained atomic data of ZnI spectral lines. In this case the reliable CuI spectral lines and atomic data were used. At the final stage of our study the laser absorption plasma spectroscopy of arc discharge between brass electrodes was carried out to examine the assumption of local thermodynamic equilibrium. The equilibrium plasma composition calculated on the base of radial temperature and electron density obtained experimentally by optical emission spectroscopy was compared with results of absorption spectroscopy. It was found that investigated plasma source at arc current of 3.5 A and 30 A is an equilibrium state. So, in a result of such complex investigation the following spectral lines ZnI 462.9, 468.0, 472.2, 481,0. 636.2 nm and relevant atomic data can be recommend to use in plasma diagnostics and for line shape calculations as well.