

SPECIFIC CONDITIONS OF GLIDARC PLASMA SPECTRAL DIAGNOSTICS

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Abstract. Optical diagnostic of the gliding arc discharge can be reliable source of information on concentrations and temperatures of plasma components in atmospheric gases. Low resolution of CCD spectrometers and non-equilibrium condition of plasma generation, including changes of ionization type from thermal to non-thermal, in a gliding arc plasma reactor requires specific approach to its spectral diagnostic.

1. INTRODUCTION

Nowadays atmospheric pressure low temperature plasmas are applied in many industrial processes. They are: (i) treatment of flue gases emitted by industrial processes of combustion, painting and varnishing, wastes utilization, deodorization, disinfection and sterilization, in which plasma based processes are the ecologically justified alternative for chemical methods; (ii) material processing and new material manufacturing for application in microelectronics and nano-technologies, in which non-thermal and non-equilibrium plasma conditions allow plasma-chemical treatment of organic materials, like rubber, fabrics, biomaterials [1].

In Poland the plasma processes, although investigated in research laboratories, are applied in industry at much less scale than in industrialized countries of Europe and all other the World [2]. Polish power industry is based on fossil fuels combustion that emits pollution in the form of sulfur and nitrogen oxides, soot and ashes, necessary to utilize. Plasma technologies can be the reasonable alternative for chemical, gypsum based wet methods, environmentally noxious, but still applied in power industrial practice.

Investigations in the field of industrial application of plasma chemical methods, conducted in many research centers and universities in Poland and abroad, are now concentrated on obtaining controllable plasma parameters and chemical reactions in large volume of treated gases [3, 4, 5, 6, 7]. Repeatability of the plasma-chemical process depends on stability of plasma parameters, which influence the proper chemical reaction path. The main parameters: are the chemical composition of the plasma gas, its pressure, flow rate, geometry of plasma reactor and electrical parameters of power system, i.e. value and form of supply voltage, power, and frequency.

2. GLIDARC PLASMA REACTOR

Arc discharge can be the source of non-thermal and non-equilibrium plasma at some conditions of power supply system, reactor electrodes' geometry and gas flow rate [8, 9]. The example of this kind of low temperature atmospheric pressure discharge that can be preformed in multielectrode reactor is the gliding arc, which typical electrodes' geometries are presented in Figure 1.

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