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Generation of moderate temperature plasma jets based on a transverse microwave discharge in a waveguide

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This work is devoted to the study of plasma jets based on an electrodeless atmospheric-pressure microwave discharge in a transverse gas flow perpendicular to the electric field strength vector. The discharge is excited in a dielectric tube in a waveguide device using a microwave generator based on a typical 1 kW magnetron operating at a frequency of 2.45 GHz. A description of the design of the gas-discharge waveguide device and the results of measurements of the spatial distribution of gas temperature in an argon plasma jet using thermocouples and optical thermography are presented. It is shown that the maximum gas temperature in the jet depends on the flow rate and can be reduced to values 180–200 degrees Celsius at a flow rate of 20–30 l/min at a distance of 2–3 cm from the outlet of the device. In this case, a laminar flow of the plasma jet into the surrounding air is observed. The results of this work are in demand for the development of new plasma sources for surface plasma modification technologies.

Keywords: microwave generator, microwave discharge, plasma jet, thermography, thermocouple, laminar flow, plasma modification.

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