Generation and investigation of plasma ball and plasma jet by microwave at atmospheric pressure

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Abstract
In this work, we first produced microwave plasma ball, then changed the ball into a microwave plasma jet by flowing a working gas through a nozzle. The effect of working gas on the thermal characteristics of the plasma ball and atmospheric pressure microwave plasma jet was investigated. We used resonant absorption scheme by a metallic antenna inside a chamber in which led to the ionization of surrounded gas forming the plasma. A commercial magnetron at 2.45 GHz was used to produce plasma by various gases such as argon, nitrogen, air and argon/nitrogen composition. For analysis and identification of reactive species in the plasma, the optical spectroscopy (OES) was carried out. Optical emission spectroscopy of the plasma ball/jet revealed the presence of reactive neutral and excited atomic and molecular components generating from working gases and antenna materials. The antenna material has a significant impact on the jet length, so that maximum length of the plasma jet was observed in Fe-Ni antenna. The results of the experiments revealed that there is no significant change in the plasma jet length versus different gas flow rates and applied powers, while it is more sensitive to the gas type and antenna material.

Keywords: atmospheric pressure microwave plasma jet, microwave plasma ball, optical emission spectroscopy

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