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低エネルギー大気圧プラズマフレアー中のストリエーション現象の発光分光計測

Optical Emission Spectroscopic Measurements of Striation Phenomena in Low Energy Atmospheric Pressure Plasma

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1. Introduction

Plasma technology has been used in many fields such as the removal of environmental pollutants, combustion assistance, surface modifications, and medical applications, and is still developing actively. There are many unknown phenomena in those application processes, although it is considered that reactive species play an important role. In the blood coagulation by low energy atmospheric pressure plasma (LEAPP) equipment[1)], minimally invasive treatment without tissue damage was performed, which was substantially different from the conventional hemostasis methods.[2)] However, detail mechanism of blood coagulation with LEAPP has not been understood.

Recently, the striation phenomena in the emission of LEAPP using neon gas were found by Fujiwara et al.[3)]. There is a possibility that this phenomena are related to the spatiotemporal variation of the electric field, and plasma parameters. In this study, to understand this phenomena, the plasma emission was measured by an optical emission spectroscopy.

2. Experimental setup

A plasma source based on a dielectric barrier discharge has been used as LEAPP. The peak-to-peak voltage applied to the electrode was ~6 kV and the frequency of the sinusoidal wave was about 61 kHz. Neon gas was used as a working gas for production of plasma. The plasma emission was measured by a spectrometer. Schematic diagram of the experimental setup was shown in Fig. 1. A copper target plate was set at 10 mm from the nozzle exit, and it was treated by LEAPP.

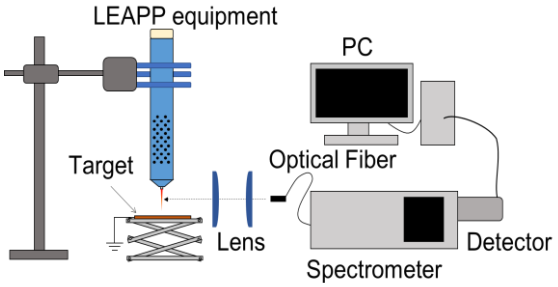

Fig. 1. Schematic diagram of the experimental setup.

3. Experimental results

As a result, strong emissions of Ne I and weak emissions of N_2^* and N^+ were observed. Furthermore, the spatial distribution of emission intensity of Ne I shows almost the same interval as the striation pattern. In the conference, results such as spatial distributions of excitation temperature and gas temperature and so on will be presented.

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