講演番号

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真空紫外吸収分光法による表面波プラズマの酸素原子絶対密度測定

Absolute Oxygen atom density measurement in surface wave plasma with Vacuum ultraviolet absorption spectroscopy method

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Low temperature plasma has been widely used in many fields because of its advantages both in physical and chemistry processing. In our previous work, O_2 and N_2 mixed plasma was used for sterilization. To study the role of plasma working on the sterilization, the information of plasma is required. As reported, the VUVAS (vacuum ultraviolent absorption spectroscopy) technique can be used for the O atom concentration measurement. In this work, we want to use this method to measure the O atom density in plasma.

In our laboratory, a compact microwave plasma light source was fabricated as the light source for the measurement. The new type microwave induced plasma light source is based on the SW (surface wave) plasma discharge. A coaxial type electrode is used and it is driven by 2.45GHz microwave. Fig.1 shows the discharge picture of the light source. With different working gas, many certain emitting lines can be produced. In this study, we intend to use this light source measure the absolute O atom density in the plasma. The emitting lines for O atom measurement is selected near 130 nm, which are 130.217 nm (3s $^3S_0$–2p^4 $^3P_2$), 130.487 nm (3s $^3S_0$–2p^4 3P$_1$) and 130.604 nm (3s $^3S_0$–2p^4 $^3P_0$). The absorption ratio of these resonance lines can be used to calculate the O atom density.

To produce such emitting lines, Ar and O_2 mixed gas is used as working gas. The emitting characteristic was checked and the optimum for producing the emitting lines was found. The O atom density with different gas ratio in a SW N_2+O_2 mixed plasma was measured and the result is shown in Fig.2. For more accurate results, more details in the measurement should be considered. The more information will be presented in the conference.

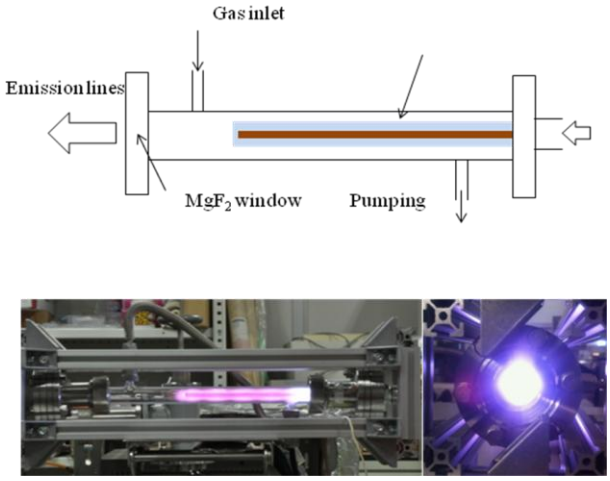

Figure.1 Structure and picture of the MIP light source. Upper one: structure
Left one: side view; Right one: front view.

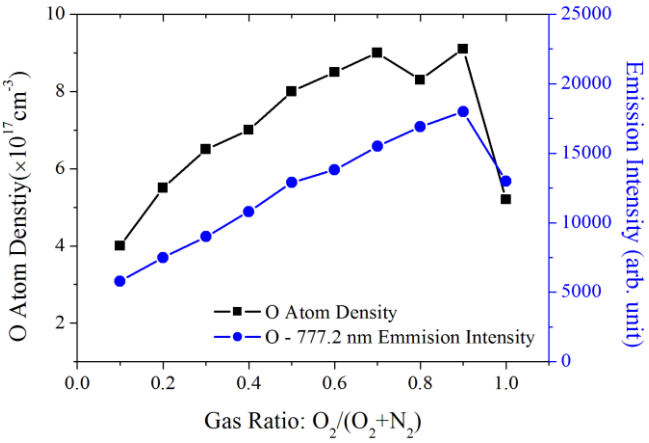

Figure.2 O atom density calculated by VUVAS method at different plasma conditions. The plasma to be measured is changed by changing the working gas ratio. The pressure and power are stable at 0.1 Torr and 600 W