22P065-P

Plasma Ionization Mass Spectrometry of Surface Adsorbates
プラズマイオン化を用いた表面吸着物の質量分析

Hiromasa Iwai, Takahiro Kenmotsu, Motoi Wada
岩井　博正，剣持　貴弘，和田　元

The Faculty of Life and Medical Sciences, Doshisha University, Kyotanabe, Kyoto 610-0321
同志社大学大学院生命医科学研究科　〒610-0321京都府京田辺市多々羅都谷1-3

Time of Flight (ToF) analysis of large molecules is accomplished by laser ionization techniques. The short width of pulse laser creates sharp trains of charged particles of different masses, while laser produced plasma ionizes the sample created by laser desorption. A plasma gun can create a similar short pulse of heat flux with directly delivering electrical charges to the desorbed particles. A compact plasma gun is being developed to test the performance as the ionizer for ToF mass spectrometer.

1. Introduction

As the ionization method for Time of Flight mass spectrometry (TOF-MS), laser soft ionization technique is widely employed. Research in biomedical engineering often requires mass analysis of volatile materials that can be kept in vacuum by letting them be adsorbed on a cold substrate. Irradiation of intense laser for this condition can create ionizing plasma on the surface of the cold substrate, but can also accelerate produced ions by the electric field created at the surface of the laser produced plasma.

A plasma gun can generate plasmoid with the speed up to 300km/s and can be an effective tool to produce short pulse heat flux to desorb samples on the substrate. As the size of the plasma is finite, the some plasma can remain near the substrate to attach electrical charge onto desorbed large molecules. Thus, a small experimental device equipped with plasma gun to examine characteristics of ionization of desorbed molecules.

2. Experimental set up

2.1 Plasma gun

Fig.1 shows a schematic diagram of the plasma gun currently being designed. Both inner and outer electrodes are made of graphite. Inside of the inner electrode is there a conduit for the plasma gas injection connected to a fast solenoid actuator. The outer electrode is biased negatively, and a discharge starts by injecting He gas into the discharge region.

A bias magnetic field is produced by a solenoid coil wound around the coaxial plasma gun. A high speed capacitor is directly attached to the electrical feed through to reduce inductance of the power supply circuit.

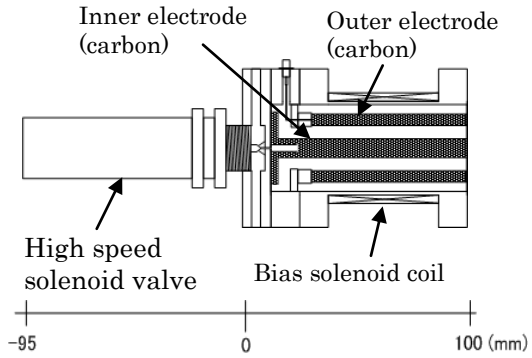

Fig.1 Schematic diagram of the plasma gun

2.2 Plasma characterization

Fig.2 shows a schematic diagram of the test chamber for the plasma measurements. The dimensions of the vacuum chamber are 146mm of inside diameter and 145mm in height. On one of the six ports is attached the plasma gun directing toward the center of the chamber. From top of the chamber one electrostatic probe is inserted into the center of the chamber to characterize the produce plasmoid. The speed of the plasmoid will be determined from the electrical signal from an electrode mounted on the port located at the opposite side of the gun.

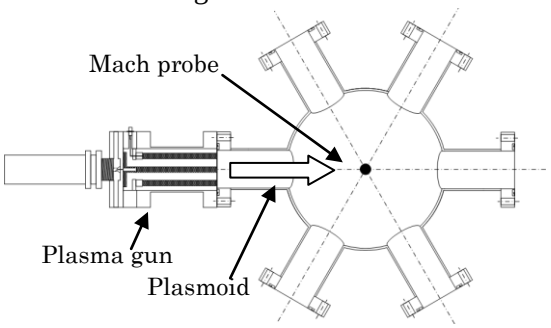

Fig.2 Schematic diagram of experimental system