

イオン衝撃効果を利用した大気圧プラズマジェットによる
テフロン®の表面修飾

**Surface Modification of Teflon® by Atmospheric Pressure Plasma Jet
with Ion Bombardment Effect**

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1. Introduction

Teflon® (Polytetrafluoroethylene, PTFE) is one of the stable and toughest polymer because of the presence of strong C-F and C-C bonds. These bonds are often hard to break, which creates difficulty in surface modifications. Surface modifications by plasma surface treatment have proven to be efficient and have been reported earlier. The widely reported low pressure plasma experiments needed high vacuum systems and are often costly. Contrary to that atmospheric pressure plasma jet (APPJ) methods have advantage as they can be used under normal atmospheric conditions.

In this study for the amino group modification of Teflon®, it was subjected to plasma surface treatment by APPJ under biased condition. Biasing creates an ion bombarding effect, which will eventually improve the modification on the surface. The details are mentioned as below.

2. Experimental details

In this experiment, PTFE with a thickness of 50µm was used. The PTFE was washed with ethanol, and fixed to the stage using the carbon tape. The Cu mask was placed on PTFE. The plasma treatment is performed using the experimental apparatus shown in Fig.1.

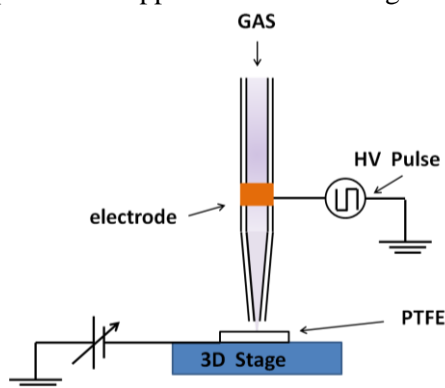


Fig.1 Schematic diagram of the experimental apparatus

APPJ device was created by winding a copper tape to the glass tube having an inner diameter of 3 mm. A 700 µm glass tube was attached to the tip of the device. The copper tape was connected to H.V power. The plasma was generated by applying a high voltage of ± 8 kV with a frequency of 5 kHz and duty ratio of 50% to the electrodes.

In here the surface PTFE was treated with mixed gas plasma of He and NH₃ to create amino functional groups. Samples were labeled with amino group specific fluorescent dye (Alexa Fluor 4885-SDP Ester), and was confirmed by fluorescence microscope.

3. Results

Fig.2 (a) shows the microscopic image of Cu mask. A fluorescent microscope image of PTFE surface after amino group modification is shown in Fig.2(b). Fluorescence pattern was similar to the mask pattern, showing clear modification in the maskless area. Hence the modification of Teflon® surface by APPJ is being confirmed.

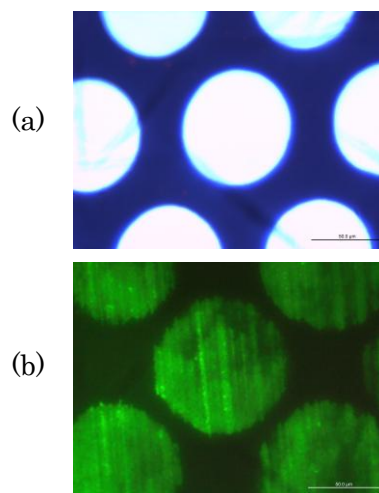


Fig.2 Images of fluorescence microscope.
(a) Cu mask, (b) PTFE surface having a modified amino group by a plasma treatment