

**[M-02]**

## **Chemical state, Gas Molecule Emission, and Adhesion Strength of PE, PVDF, and PTFE Irradiated by keV of Ar<sup>+</sup> ion Beam**

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In this molecular emission study, PE, PVDF, and PTFE surface was irradiated by 1.0 keV ion beam in an O<sub>2</sub> environment. The ion beam current density was fixed at 14.15 $\mu$ A/cm<sup>2</sup>. The base pressure was 5 $\times$ 10<sup>-6</sup> and working pressure 1.4 $\times$ 10<sup>-4</sup> Torr. Due to low vacuum in this chamber, ionization & regulation part was not used and ionized species were only detected. The emitted species of PE were identified as H<sup>+</sup>, H<sub>2</sub><sup>+</sup>, and CH<sub>2</sub><sup>+</sup>. The emitted species of PVDF were mainly identified as F<sup>+</sup> and HF<sup>+</sup>. Very small CF<sub>2</sub><sup>+</sup>, CH<sub>2</sub><sup>+</sup>, and the other species were detected. This phenomenon of F<sup>+</sup> and HF<sup>+</sup> emission can be originated from fluorine preferential etching and cage effect. In the case of PTFE, carbon backbone were broken and emitted by Ar<sup>+</sup> ion beam. Backbone molecules such as CF<sup>+</sup>, C<sub>2</sub>F<sub>2</sub><sup>+</sup>, C<sub>2</sub>F<sub>3</sub><sup>+</sup>, and F<sup>+</sup> were detected and this sputtering effect can be related to cone-type surface of the irradiated PTFE. The activated sites of irradiated polymeric surface can be deduced by molecular emission species, and the chemical reactions on the surface could be scrutinized by means of molecular emission, newly formed functional groups, nuclear scattering cross section(stopping power), and ion beam energy.

ge of surface properties were monitored by contact angle measurements and its chemical variations were analyzed by IR, and XPS. Both modifications cause surface oxidation of polymer film, which is connected with formation of functional groups enhancing polymer wettability. This process is very fast and efficient in mixed Ar + O<sub>2</sub> RF plasma but relatively slower during polymer exposure to others. The interface reaction of sputtered Ti have been studied using high resolution X-ray diffractometer(HRXRD) and X-ray photoelectron spectroscopy(XPS). The reactions of Ti with polymer lead to the simultaneous formation of TiCl<sub>2</sub>(PVC), TiC, Ti-oxide.