

[III~14]

Effects of 1 keV Ar⁺ irradiation with and without oxygen environment on the wettability, chemical structure, and topology of PET surface

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A surface of PET film was irradiated with 1 keV Ar⁺ ion beam with and without oxygen environment. The modified surface was analyzed with contact angle measurements, XPS, and AFM. When PET was Ar⁺ irradiated without oxygen environment, the wettability of PET increased a little and remained constant with increasing ion dose, whereas the peak ratio (O/C) decreased and the roughness (rms) increased. On the other hand, when PET was irradiated under oxygen environment, the wettability and the peak ratio (O/C) of PET were remarkably increased with increasing ion dose up to 10¹⁶ ions/cm² and then decreased at higher ion dose. XPS spectra showed that the incorporation of oxygen into the PET surface takes place during the irradiation under oxygen, while the depletion of oxygen component in PET occurs during the irradiation without oxygen. The improved wettability of PET by irradiation under oxygen was reduced with time as exposed to air and reached to the limiting value which was then increased again when dipped into water. On the contrary, the wettability kept constant with time when reserved in water. Changes in wettability of PET depending on the irradiation conditions are explained in correlation with the change in the chemical composition and the roughness at the surface. In addition, the chain mobility of hydrophilic segments at the surface were investigated and discussed.