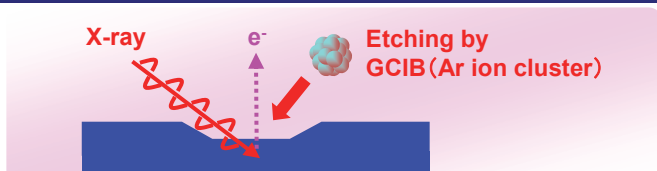


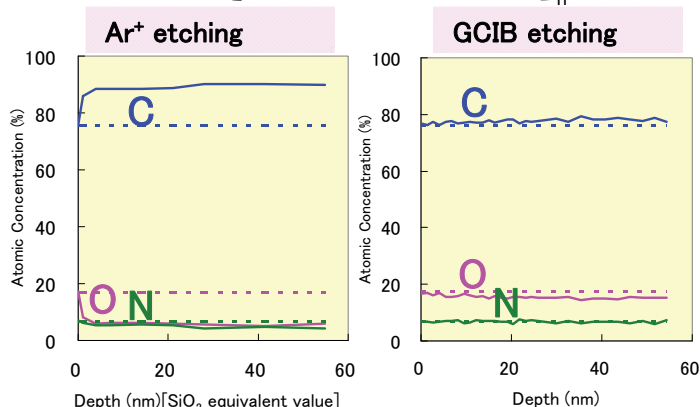
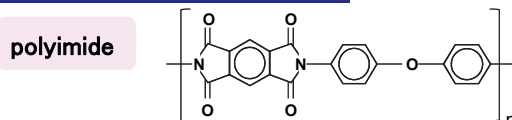
XPS analysis using the GCIB etching

The sample damage during the GCIB (Gas cluster ion beam) etching is very small, so depth profile analyses of organic materials are possible by using the GCIB etching. In addition, the GCIB etching is effective as the method of cleaning organic contamination on the inorganic material surface.

1. Summary of the GCIB-XPS and the depth profile analysis of the polyimide

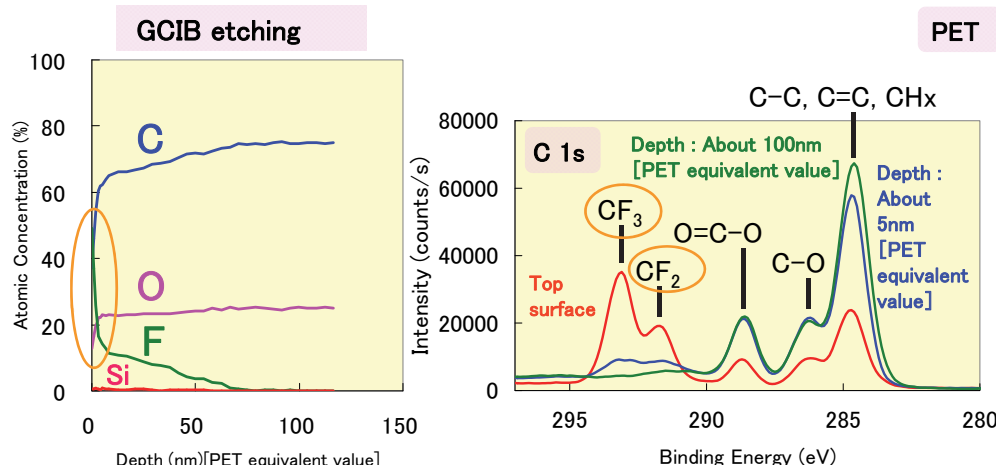


XPS (X-Ray Photoelectron Spectroscopy) is the method to analyze the chemical state and elemental composition in the region of a few nm of the surface. The depth profile analysis is also possible by using the ion etching. If the Ar^+ ion etching is applied to the organic material such as the polyimide, since the sample damage is large, it is not possible to obtain a correct result. On the other hand, by using the GCIB etching, it is possible to reduce the damage. The GCIB etching rate of inorganic materials is very slow. Therefore, it is possible to clean the organic contamination on the inorganic material surface by the GCIB etching.



The dashed line is the value expected from the chemical structure of the polyimide.

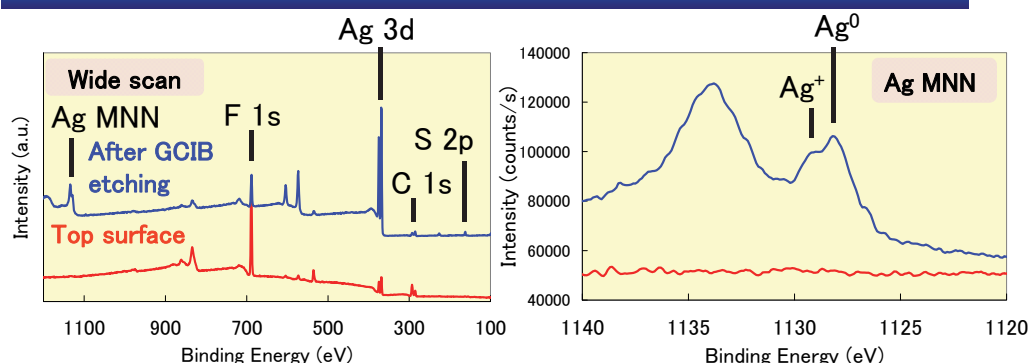
2. The depth profile analysis of PET (polyethylene terephthalate) with fluorine coating by GCIB-XPS



From the depth profile of fluorine, fluorine is distributed near the top surface. From the C 1s spectrum of the top surface, it is found that the CF_2 and CF_3 components are present in the top surface.

The $\text{O}-\text{CF}_2$ component is included in the CF_3 component. The $\text{O}-\text{CF}$ component is included in the CF_2 component.

3. The surface cleaning by the GCIB etching of the silver discolored



At the top surface, the Ag MNN auger peak for determining the valence of the silver is not detected due to contamination. From the Ag MNN peak position after removing the contamination by the GCIB etching, it is found that Ag^+ component (such as Ag_2S) is present in addition to Ag^0 (metal) component.