eurofins | EAG Laboratories

APPLICATION NOTE

Depth Profiling of Thin Organic Films

INTRODUCTION

Cellphone screens are quite vulnerable to damage and are often protected with optional secondary layers. Generally, these screen protectors are glass or plastic and have a thin oleophobic coating. The purpose of the coating is to prevent fingerprints from building up on the screens. Over time, the coating wears down and the fingers leave oil on the surface and thus the fingers do not slide as efficiently on the surface of the protector.

EXPERIMENTAL

We investigated a new as-received screen protector and compared it to one that was exposed to UV light for a week. The study was performed using Time-of-Flight Secondary Ion Mass Spectrometry (TOF-SIMS) to characterize the surface coatings on the screens and to compare the thickness of the coatings with depth profiles. The sputter rate was determined with a known reference. The depth profiles of the organic film were carried out using argon clusters as the sputter species. This allows the profiling of the oleophobic coating (organic films) while maintaining the molecular information.

RESULTS

The spectra from the as-received surface and the UV exposed surface were similar with no major differences as seen in Figure 1. The spectra from both surfaces were dominated by $C_xF_y^+$ and $C_xF_yO_z^+$ ions from the oleophobic coating. However, the depth profiles of the two samples showed major differences in the thickness of the oleophobic coating. The coating on the UV exposed sample was much thinner than the as-received sample. This can be seen by comparing the depths at which the intensities of the fluorocarbon fragments fell to one half their initial values. The C_sF_5 fragment, for example, fell to one half its initial value at a depth of 19 nm on the as-received sample and at 5 nm on the UV exposed sample. Figure 4 shows the spectra from the two samples acquired at a depth of 12 nm. The spectra here nicely illustrate the depletion of the oleophobic coating on the UV exposed sample.

CONCLUSION

UV exposure causes a significant thinning of the oleophobic coating, hence affecting its performance. Depth profiling into organic films using the argon cluster sputter beam provide valuable information while preserving the molecular information.

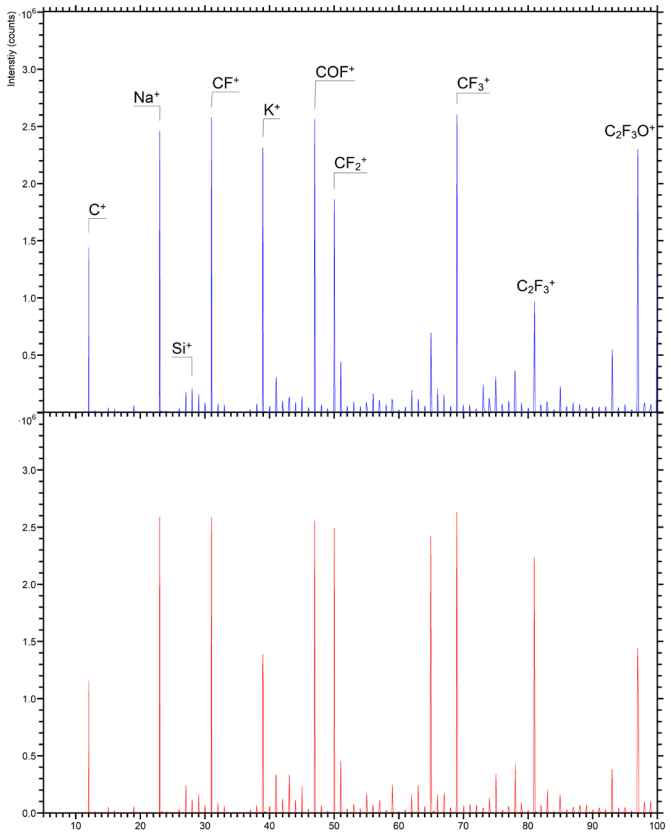

Figure 1: Surface Spectra in Positive Ion Mode: Blue: As-Received; Red: UV Exposed

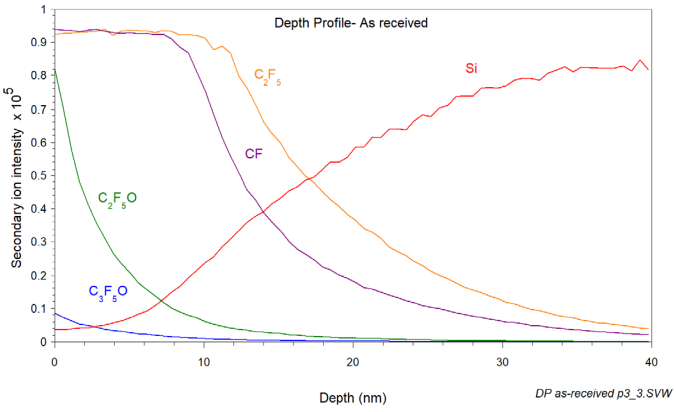

Figure 2: Depth Profile – As- Received Sample

Depth Profiling of Thin Organic Films

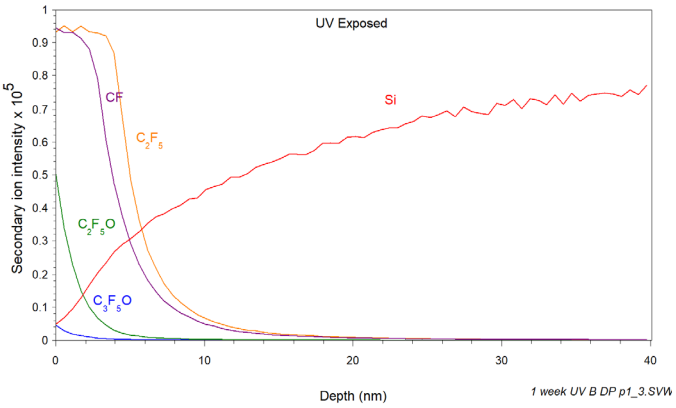

Figure 3: Depth Profile – UV Exposed Sample

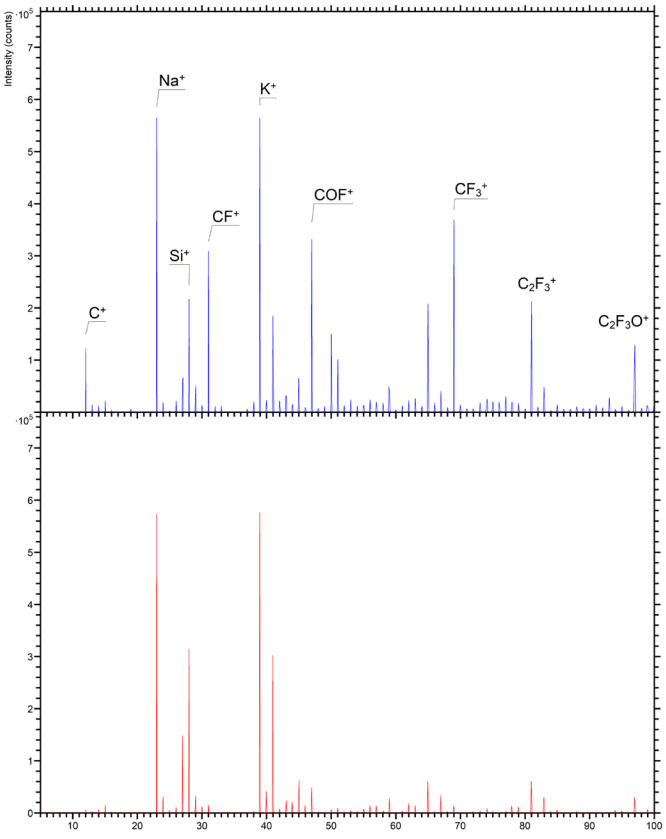

Figure 4: Spectra from 12 nm Depth in Positive Ion Mode: Blue: As-Received; Red: UV Exposed