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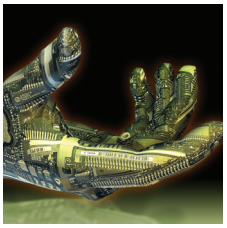
GDOES

Do you know what is protecting your telephone screen?



Application Note

Material Science GD36

Sofia Gaiaschi, HORIBA Scientific, 16 rue du Canal, 91160 Longjumeau, France

Abstract: Optimization and follow up of manufacturing process of plastics films are easily achieved using Pulsed RF Glow Discharge Optical Emission Spectrometry. This technique allows the fast detection of defects and presence of contaminants.

Key words
Polymers, Smartphone, Depth Profile Analysis, Ultra Fast Sputtering, GD OES, Pulsed RF source

Introduction

Nowadays screen protectors are not as necessary as they once were. Nevertheless, the Gorilla™ Glass* screen of your mobile phone can still be scratched with the sand in your pocket, or it can be cracked when you drop it. For this reason the so called «screen protectors» have become more and more popular. The cheapest ones are usually plastic films that you can stick on your telephone screen. However, are you sure you know what you are covering your phone with? With the development of pulsed Radio Frequency source and the invention of the Ultra Fast Sputtering («UFS»), Glow Discharge Optical Emission Spectroscopy can easily answer to this question [1,2].

Instrumentation and sample preparation

The GD Profiler 2 (Figure 1) couples an advanced Pulsed RF-GD source to a high resolution, wide spectral range Optical Emission Spectrometer. The precise and fast sputtering of a representative area of the investigated sample (usually a crater of 4 mm in diameter) is assured using an RF-pulsed source, which allows also the reduction of the thermal load on the sample, preventing any damage. All elements of interest are simultaneously measured, as a function of the sputtering time, using a spectrometer.

Figure 1: GD Profiler 2

A common plastic screen protector was bought to study its composition. Such films are thin and flexible and therefore for a proper analysis with RF-GDOES it is necessary to cut them and glue them on a rigid substrate, as shown in Figure 2 (a proprietary methodology was used to glue the film to an Al plate and the obtained GD craters are nicely visible).

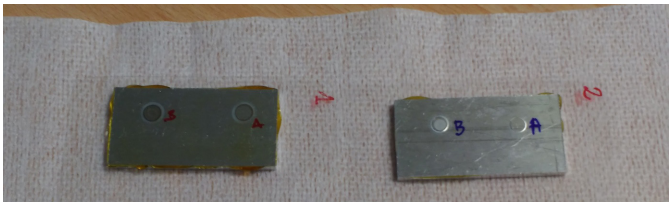


Figure 2: The two sides of a plastic screen protector, after a GD analysis.

Results

Using the RF-GDOES we investigated the two sides of the plastic screen protector. The so called «side 1» corresponds to the part of the film that touches directly the screen glass of the smartphone, whereas the so called «side 2» is the top surface that one touches on a daily basis and that is usually mostly damaged.

While the «side 2» was analyzed with the patented UFS, the «side 1» was studied without such system.

In Figure 3 the profile obtained for the «side 1» is shown.

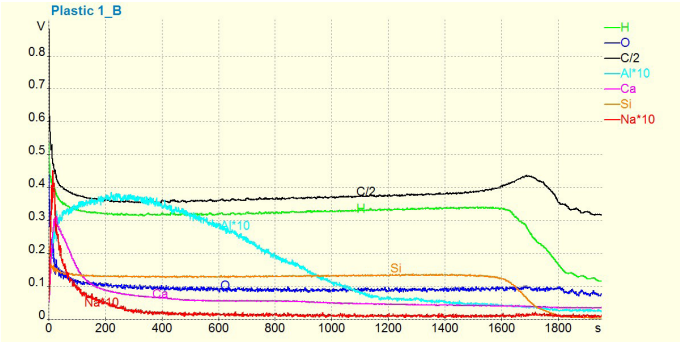


Figure 3: RF-GDOES elemental profile of the «side 1» of a plastic screen protector.

The sputtering is slow, though some useful information can be obtained. On the other hand, in Figure 4 the elemental depth profile of «side 2» is presented, showing the interest of the UFS system. In less than 10 minutes the whole layer was sputtered (over 100 microns) and the «side 1» was reached. The obtained GDOES crater, which is deep, shows a flat crater bottom and the absence of redeposition on the edges (Figure 5).

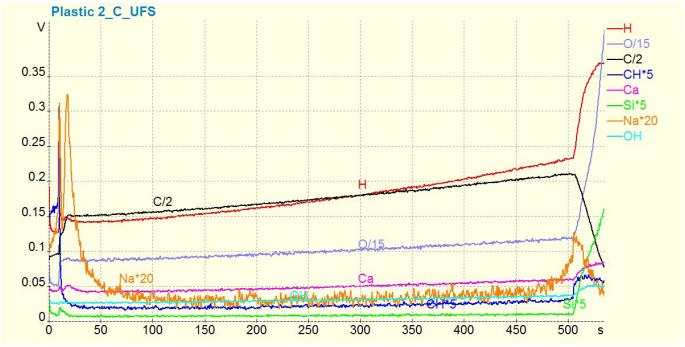


Figure 4: RF-GDOES elemental profile of the «side 2» of a plastic screen protector

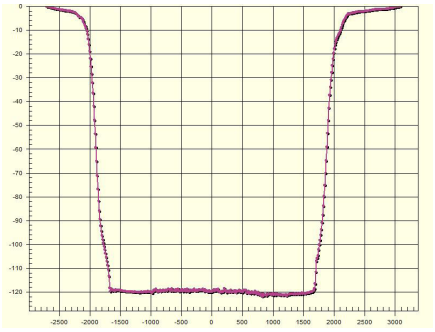


Figure 5: GD crater obtained on the «side 2» of the plastic screen protector. Over 100 µm were sputtered in less than 10 minutes.

The elemental profile of «side 2» shows that the film is clearly composed of a stack of different polymers, as highlighted by the evolution of the carbon and sodium profiles (Figure 6).

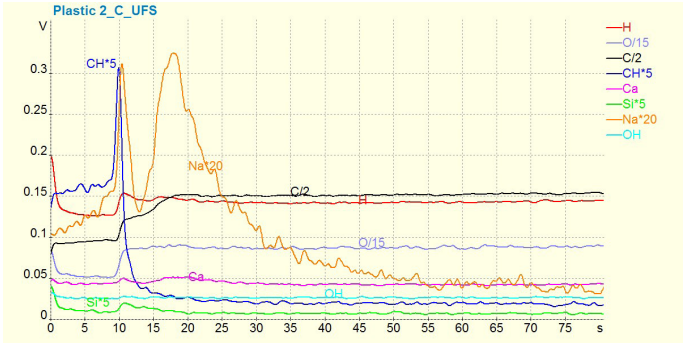


Figure 6: Surface zoom of the RF-GDOES elemental profile of the «side 2» of a plastic screen protector.

Conclusion

The GD Profiler 2 can be a key instrument during the optimization and follow up of manufacturing process. Indeed, GDOES is a fast technique which allows the easy comparison of different materials, the detection of defects and the presence of contaminants. Moreover, combined with the «UFS» system, it proves to be a flexible technique for organic and hybrid materials opening numerous new applications domain.

* Gorilla Glass is a Trademark from Corning Inc. Note that Corning is using GD to study these glasses.

References

[1] Patent EP20110306147
[2] HJY application note AN GD21

JOBIN YVON Technology

HORIBA Scientific

info.sci@horiba.com www.horiba.com/scientific

USA: +1 732 494 8660
UK: +44 (0)20 8204 8142
China: +86 (0)21 6289 6060
France: +33 (0)1 69 74 72 00
Italy: +39 2 5760 3050
Brazil: +55 11 2923 5400
Germany: +49 (0)6251 8475-0
Japan: +81 (75) 313-8123
Other: +33 (0)1 69 74 72 00