HORIBA Scientific

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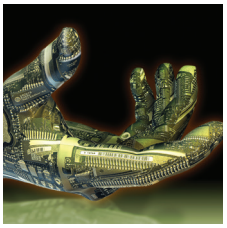
GDOES

Analysis of films on glass by pulsed RF GDOES



Application Note

Material Science GD32

Patrick Chapon, HORIBA Scientific, 16 rue du Canal, 91160 Longjumeau, France

Abstract: Some examples of elemental depth profiles of films on glass are shown coming from published data and results from the GD days illustrating the capability of the Pulsed RF GDOES instrument in this domain.

Key words
Coatings on Glass, GDOES, Pulsed RF. Fast elemental depth profiling, Glow Discharge Optical Emission Spectroscopy

Introduction

Coatings on glass are extensively used in multiple domains from thin films PV cells to optical coatings, IR protective layers on windows to gold coatings on the HORIBA Scientific SPRi prisms!

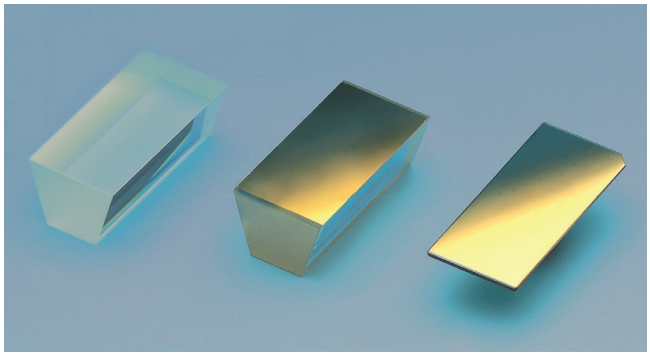


Figure 1: HORIBA Scientific SPRi chips

Multiple deposition techniques are used to coat glasses (PVD, sol gel dip coating, CVD etc – Ref 1). GDOES permits to rapidly obtain the elemental depth profiles and assess the quality of the coatings and the reproducibility of the selected deposition technique (Ref 2).

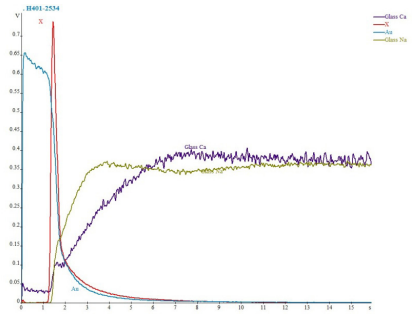


Figure 2: Depth profile of a SPRi prism featuring the Au top layer on a sublayer on glass

Instrumentation

The GD Profiler 2 couples an advanced Pulsed RF Glow Discharge Source to a high resolution, wide spectral range Optical Emission Spectrometer. RF is of course mandatory when non conductive samples are to be measured but RF only is not sufficient as induced heat could be generated on the sample during the measurement leading to unwanted diffusion of elements. This is why pulsed RF (with patented automatic matching in pulsed mode) is crucially important for coated or treated glasses analysis (Ref 3 & 4).

Figure 3: GD Profiler 2 instrument

Results

The first result is from Ref 2 in which titanium oxy-nitride films are studied as energy efficient glazing.

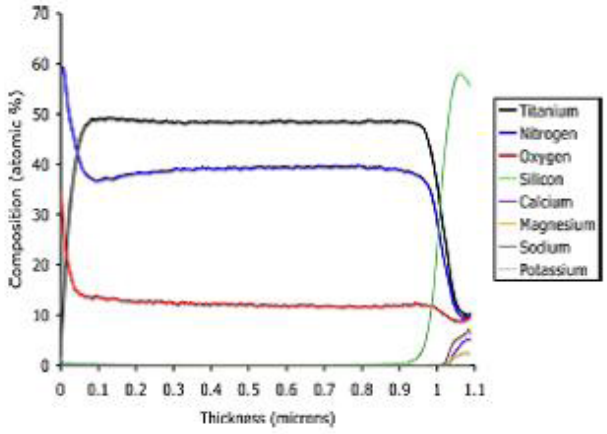


Figure 4: Pulsed RF GDOES profile of a TiON film on glass (from ref 2)

The second measurement has been shown at the 7th GD day (Ref 5). The sample is a Rugate filter with 46 periods of SiO_2/Ta_2O_5 on glass. The depth resolution here was better than 50 nm at 9 µ sputtered depth!

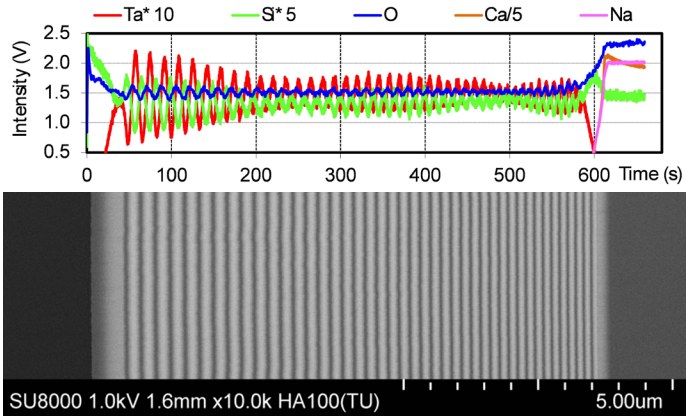


Figure 5. Pulsed RF GD-OES intensity-time-profile and FE-SEM micrograph

Conclusion

Pulsed RF GDOES is a valuable technique for fast elemental depth profile of coated and treated glasses. It is capable to measure all elements with excellent depth resolution and provide information on layers composition and thickness, diffusions or contamination at interfaces.

References

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HORIBA Scientific

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

USA: +1 732 494 8660 **France:** +33 (0)1 69 74 72 00 **Germany:** +49 (0)89 4623 17-0
UK: +44 (0)20 8204 8142 **Italy:** +39 2 5760 3050 **Japan:** +81 (0)3 6206 4721
China: +86 (0)21 6289 6060 **Brazil:** +55 (0)11 2923 5400 **Other:** +33 (0)1 69 74 72 00