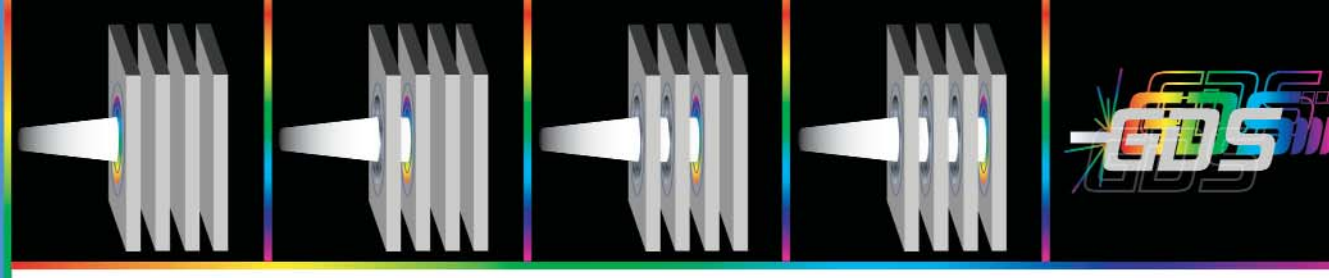
Glow Discharge



Quantified depth profile of a pre-painted steel sheet.

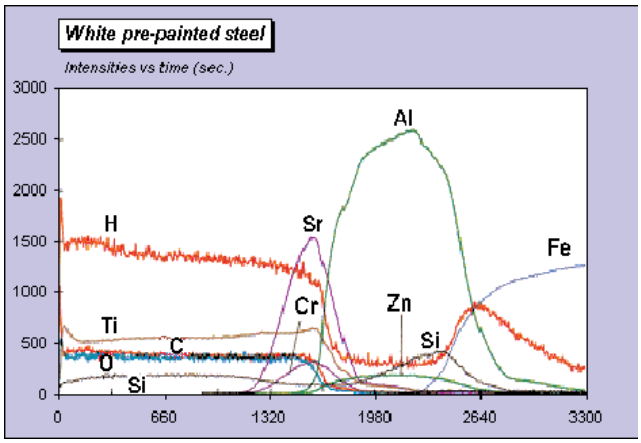
This application shows the ability to quantify depth profile analysis of a non-conductive material made with an RF source.
The sample is a white pre-painted steel sheet. The successive layers are organic coatings and galvanization on the steel substrate. This type of material is mainly used in building industry.
Depending of the use of this material (mountain or seaside, cold or hot atmosphere, dry or wet climat) the composition of coatings and the elements present at the interface organic coating/galvanization are essential. The coating behaviour vs exposure time at the sunshine is also very important.

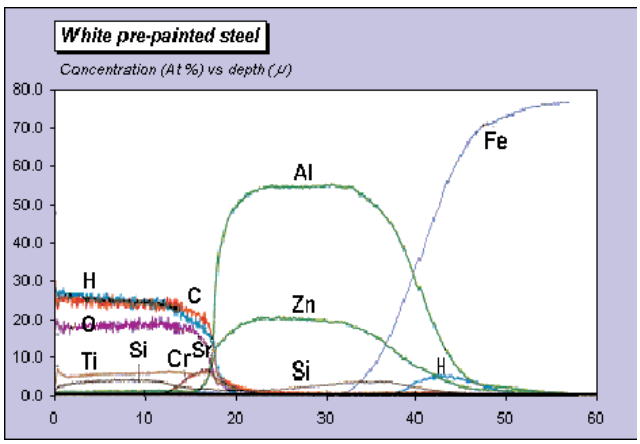
The analysis has been achieved with a 4 mm diameter anode. The analytical parameters have been chosen in order to obtain a good depth resolution while keeping the sample cool (10°C). The PM voltages are automatically adjusted with the HDD system (HDD: High Dynamic range Detector) during data acquisition.
The quantitative computation needs a previous calibration for all elements which is achieved from some standard samples. This calibration takes in account the sputtering rates of the standards and their specific gravities, if the results are given in % weight.

QUALITATIVE ANALYSIS

The qualitative analysis leads to a diagram Intensity (arbitrary unit) vs time (sec).

The diagram shows the organic coating during "1500 sec (white paint containing Si and Ti) and then the galvanization (Al/Si/Zn layer). Cr and Sr can be seen at the interface of both layers. The RF GD-OES technique allows to identify the different layers of various compositions with a good resolution.





QUANTITATIVE ANALYSIS

The new algorithms of the QUANTUM software, especially developed for the RF source, allow to convert the previous diagram to a Quantitative depth profile: element concentration (%) vs depth (µm).

In this case, the paint layer is "18 µm thick and the thickness of the galvanization is close by 25 µm; The presence of H at the interface galvanization-steel is due to the chemical process

JOBIN YVON HORIBA