

**Abstract for Thermo Scientific Seminar:**

**12:30-13:15 Tuesday 18 September**

**12:30-13:15 Thursday 20 September**

To register for this seminar please visit the Thermo Scientific booth #305 or visit  
[www.thermoscientific.com/emc2012](http://www.thermoscientific.com/emc2012)

**Full Chemical Characterization for Surfaces and Microstructures with XPS and Microanalysis**

K. Thompson<sup>1</sup>, P. Camus<sup>1</sup>, R. G. White<sup>2</sup>, T. S. Nunney<sup>2</sup>

<sup>1</sup> Thermo Fisher Scientific, 5225 Verona Rd, Madison, WI 53711, USA

<sup>2</sup>Thermo Fisher Scientific, The Birches, Imberhorne Lane, East Grinstead, West Sussex RH19 1UB, UK

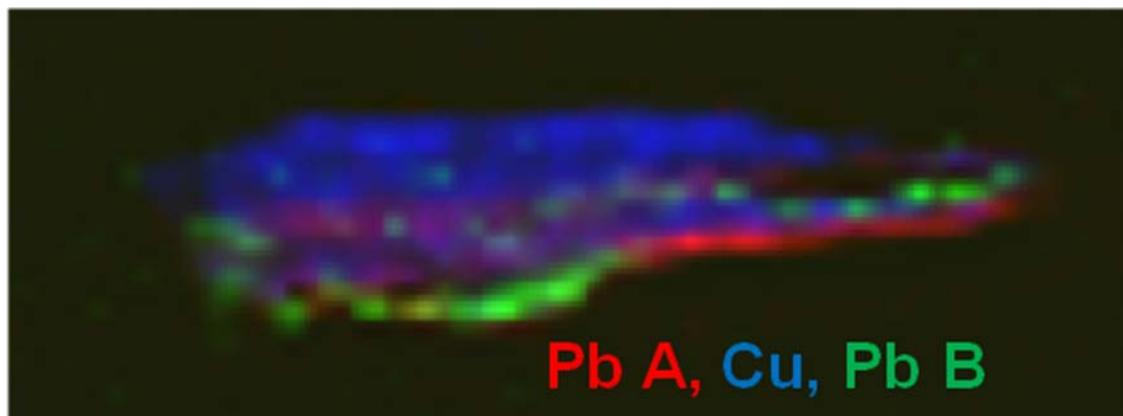
Full chemical characterization of a sample necessitates measurement of both bulk and surface properties. To achieve this an array of experimental techniques may be employed; allowing the field of view to be narrowed both in the X-Y plane - to investigate changes in lateral near surface morphology - and in Z to enable the understanding of varying surface and interfacial chemistry with depth.

This presentation will use several analysis examples to demonstrate the power of using a multi-technique approach for complete chemical characterisation. XPS is used for surface characterisation and EDS, WDS and EBSD for near surface (5 micron depth) compositional and structural analysis.

The first example describes the use of XPS and EDS to investigate a sample taken from a painting where the chemistry is known to be changing with time resulting in dramatic changes in the painting's appearance. EDS analysis indicated that a higher proportion of lead had accumulated near the surface of the outer paint layer. XPS imaging of the sample in conjunction with multivariate statistical analysis of the data allows the chemical state of the individual components to be distinguished. These analyses were compared with spectra from reference pigments to identify the original paints used.

The second example concerns the analysis of a meteorite sample of unknown composition. The phase mapping package COMPASS has the ability to take a sample of unknown origin and reveal even small and unique phases defined by trace elements that would traditionally go unnoticed. Both the EDS and XPS measurements confirm that the sample is fully oxidized. The fully oxidized (or weathered) state of the meteorite tells us that it landed on the Earth several million years ago. The EDS analysis identifies the primary phases that exist. It also reveals and types the regions with unreacted components, which provides a chemical history of the phase evolution within the meteorite over several millions of years. .

**Fig. 1 XPS chemical state mapping of Paint Chip**



**Fig. 2 Meteorite: EDS composition analysis**

