

# Identifying Stains on Packaging Materials with PHI Scanning XPS Microprobes

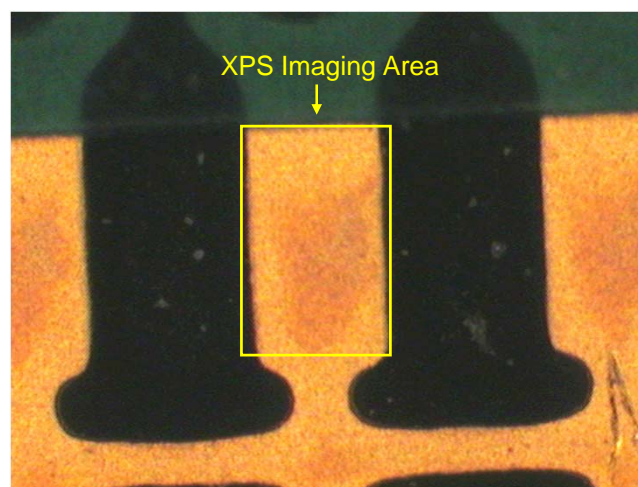
## Introduction

Packaging materials with stained bond pads are usually rejected whether or not the stain interferes with bonding. Stains are typically process residues or diffusion products that form a thin contamination layer on the surface of the bond pad.

These stains are frequently too thin to detect with analysis tools such as SEM/EDX or Micro-FTIR and require the use of a surface analysis tool for characterization.

## Micro-area Spectroscopy

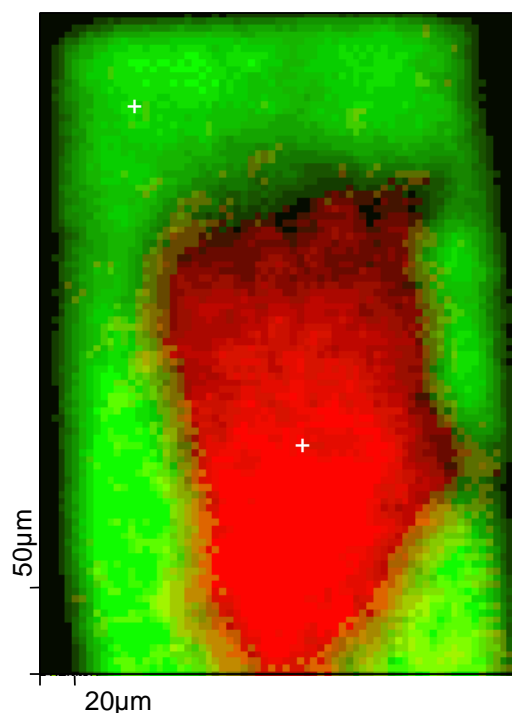
In this example, the micro-area spectroscopy and imaging capabilities of the *Quantera II* Scanning XPS Microprobe were used to identify the composition of a stain on a gold bond pad.



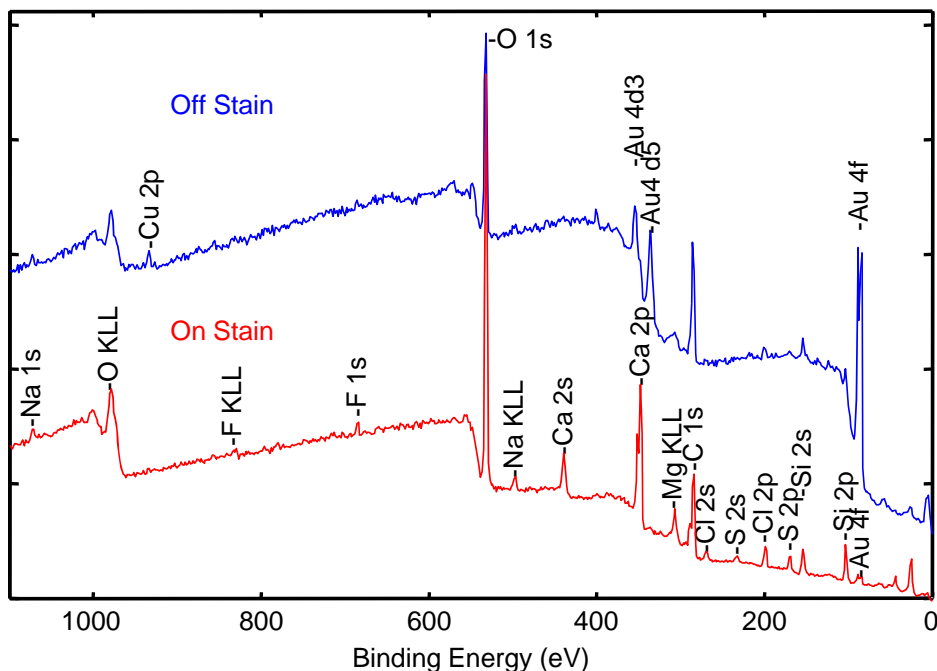
Optical image of stained gold pads on a printed circuit package (1072 x 812  $\mu\text{m}$ ) obtained with the *Quantera II*'s sample positioning station

Surface Composition (Atom %)		
Element	On Stain	Off Stain
Carbon	29.8	47.8
Oxygen	47.0	31.2
Gold	0.2	5.5
Copper	0.0	0.5
Calcium	8.5	0.0
Silicon	7.8	9.7
Nitrogen	0.0	3.4
Fluorine	1.2	0.0
Chlorine	1.9	1.2
Sulfur	1.7	0.0
Sodium	1.0	0.0
Magnesium	0.9	0.0

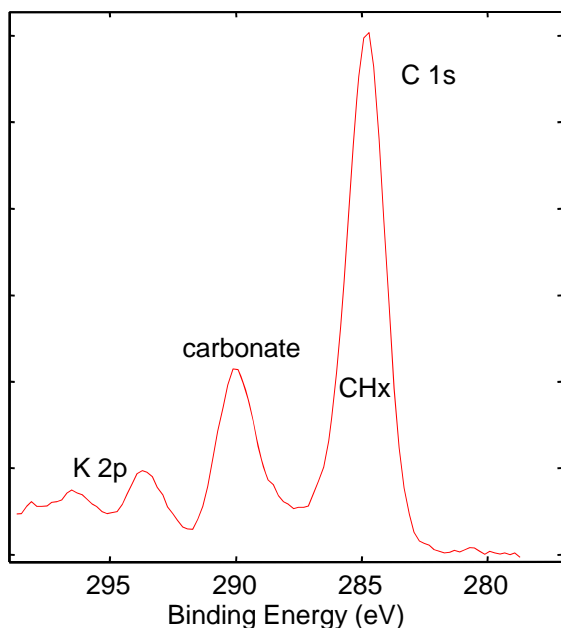
XPS data show the presence of calcium, fluorine, sodium, chlorine, and magnesium in the stained area.



XPS images of calcium (red) and gold (green) show calcium is associated with the stain. Compositional data was obtained at the indicated (+) locations on and off of the stain.



Calcium and other contaminants were detected in the stained area using a 50  $\mu\text{m}$  diameter x-ray beam.



High resolution carbon spectrum from the stained area shows the presence of a carbonate.

### Summary

The *Quanterra II* SXM provides high micro-area sensitivity for the detection of contaminants associated with stains or defects. In the example presented here calcium, fluorine, sodium, chlorine, and magnesium were detected on a stain. Chemical state information available from the XPS data revealed calcium carbonate to be a significant component of the stain.



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