

# Identifying Organic Defects with PHI Scanning XPS Microprobes

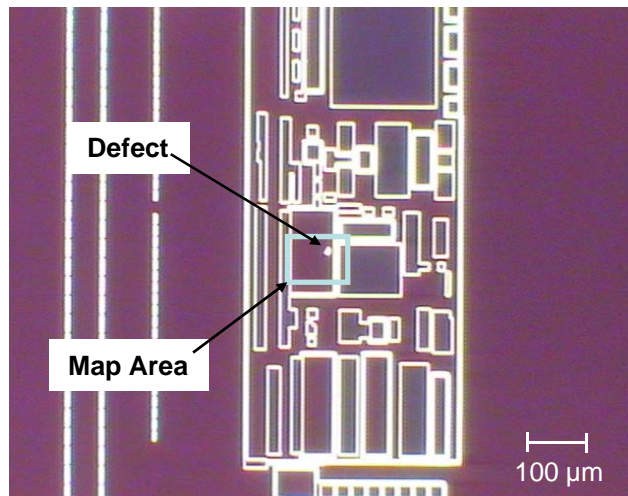
## Introduction

Determining the composition of defects is a critical part of defect sourcing and yield enhancement.

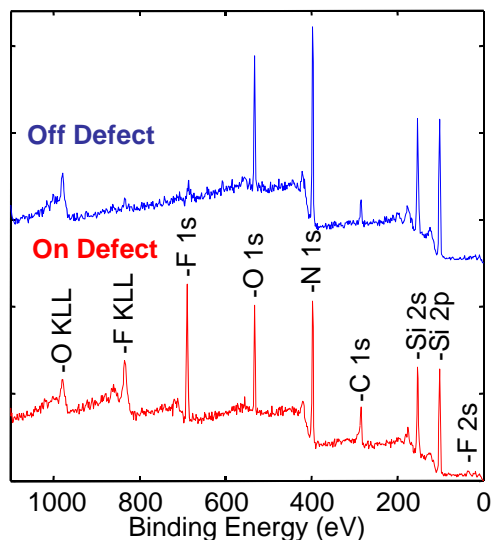
In this example, the unique ability of the *Quanterra II* Scanning XPS Microprobe to characterize 10  $\mu\text{m}$  diameter features, facilitated the identification of organic particles that were detected after a wafer clean.

## Micro-area Spectroscopy

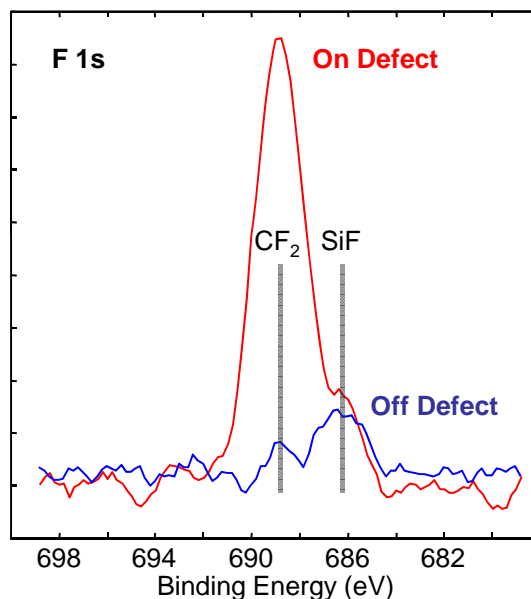
The defect was located optically with the *Quanterra II*'s sample positioning station. Using an 8  $\mu\text{m}$  diameter x-ray beam XPS survey spectra were collected on and off the defect area. The survey spectra show the defect to contain a large amount of F.



Optical image of an organic defect obtained with the *Quanterra II*'s sample positioning station



Survey spectra obtained in a few minutes using an 8  $\mu\text{m}$  diameter x-ray beam detected a large amount of fluorine in the defect area



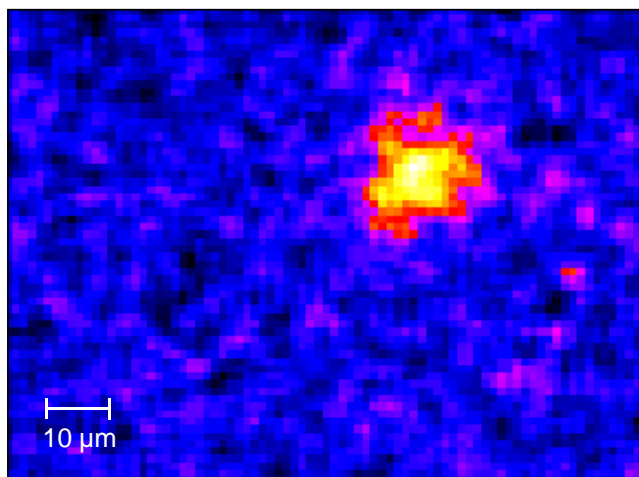
High resolution F 1s spectra show the presence of a fluorocarbon on the defect and a SiF process residue on the wafer.

Surface Composition (Atom %)		
Element	On Defect	Off Defect
Nitrogen	29.8	40.7
Silicon	24.0	32.4
Oxygen	13.1	17.2
Carbon	16.6	8.5
Fluorine	16.5	1.1

### Summary

10  $\mu\text{m}$  organic particles were detected by an optical defect detection tool and relocated with the *Quanter* II's sample positioning station. XPS spectra collected on and off of the defect, with an 8  $\mu\text{m}$  diameter x-ray beam, showed more carbon and fluorine to be present on the defect. A fluorine map verified the correlation between high fluorine concentration and the defect. High resolution fluorine 1s spectra show the defect to be a fluorocarbon material and identify the small amount of fluorine on the wafer as a SiF process residue.

The unique design of PHI's scanning XPS microprobes provides SEM-like ease of use and the highest sensitivity available for micro-area spectroscopy. Complete survey spectra and high resolution spectra provide rapid identification of unknown contaminants, accurate quantification, and detailed chemical state information.



*A Fluorine map confirms the correlation of high fluorine and the defect*