



Physical Electronics USA, Inc. Newsletter

PHI Newsletter

July 2012

Dear Physical Electronics Customer -

Here we are, already in the back half of 2012; it has been a while since our last newsletter. Physical Electronics USA just closed the books on another fiscal year and we're happy to report our sales were the highest in company history, far exceeding projections. It's noteworthy that we sold more Quanteras than in any previous year. We owe a heartfelt thanks to our loyal customers!

I hope you will take a few minutes to read the article below that addresses the advancements in Auger technology over the past few decades, and learn how the imaging capabilities we have today far exceed those that were previously available.

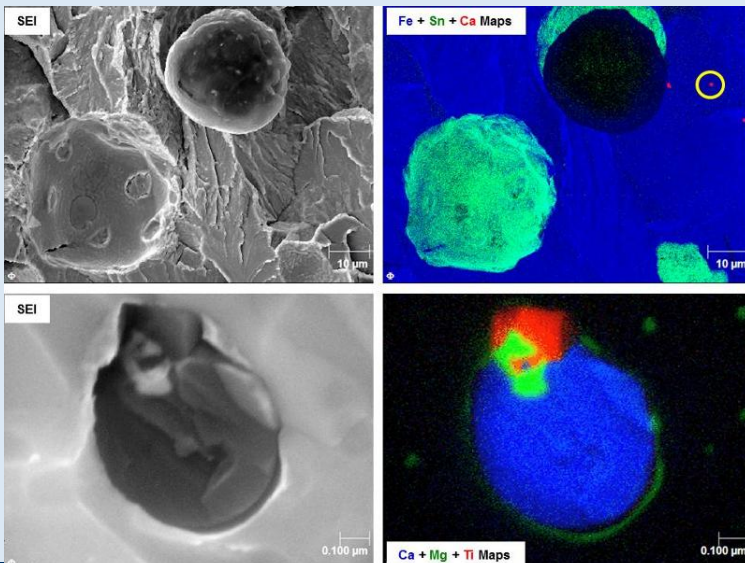
Sincerely,
Wolfgang Betz
European Sales Director
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Superior Auger Mapping with the PHI 700Xi

Segregation of Impurities to Interphase Boundaries in Ductile Iron

Grain boundary embrittlement and high temperature grain boundary instability are important factors in the quest for higher performance metals for many industrial applications. Of particular importance is the composition of interphase boundaries (the interface between separate phases) in these metals. Scanning Auger spectroscopy combined with *in situ* fracture analysis provides a unique capability to expose the surfaces of the interphase boundaries and provide compositional analysis and elemental mapping of these topographically challenging surfaces. An earlier study provided a wealth of information about the effects of different additives on the eutectic transformation of ductile iron¹. This earlier study utilized *in situ* fracture analysis with a PHI Model 590 Scanning Auger Microprobe with a spatial resolution of 200 nm. Today the PHI Model 700Xi Scanning Auger Nanoprobe with a spatial resolution down to 8 nm provides a dramatic improvement in Auger mapping and spectroscopy capabilities.



The upper left panel shows a Secondary Electron Image (SEI) of a ductile iron sample with 0.11% Sn that was fractured in a PHI 700Xi. The upper right panel shows color overlay Auger maps for: Sn (green), Fe (blue), Ca (red), and Fe+Sn (light green). The field of view (FOV) for the upper images is approximately 100 µm. The lower left panel shows an approximately 1 µm FOV SE image of one of the small Ca containing precipitates observed in the 100 µm FOV Auger maps. The lower right panel shows Auger color overlay maps for Ca (blue), Mg (green) and Ti (red) of the same precipitate structure.

The PHI 700Xi Scanning Auger NanoProbe combined with an *in situ* fracture stage provides a unique capability for the analysis of interface boundaries observed on fractured metal surfaces. The 8 nm spatial resolution of this state-of-the art scanning Auger instrument facilitates comprehensive analysis of the smallest features. This spatial resolution, when combined with software controlled image registration, allows high sensitivity Auger mapping and spectroscopy (not shown) of multiple phases observed within small areas. The CMA allows full Auger mapping and high sensitivity spectroscopy of all nodules and craters produced during the fracture analysis without any observed topographical shadowing. The Auger analysis confirms that the graphite nodules separate at the interface with the interphase boundaries that form as a result of segregation of minor constituents in the iron such as Sn, Ca, S, Mg, O and Ti. This surface analysis capability should have extensive applications in the continued development of new high strength metallurgical materials.

Reference 1: W. C Johnson and B. V. Kovacs, Metallurgical Transactions A, 9A 219-229 (1978).

To view a more detailed presentation of this work visit our website at www.phi.com and download the Auger application note titled: *Segregation of Impurities in Ductile Iron*.

Upcoming PHI Events

SIMS Europe 2012

Munster, Germany
September 9 – 11, 2012
<http://www.sims-europe.eu>

Biointerface

Dublin, Ireland
October 23 – 25, 2012
<http://surfaces.org>

59th American Vacuum Society (AVS) International Symposium and Exhibition

Tampa, Florida
October 30 – Nov 1, 2012
<http://www.avs.org>