

AUTOMATED PICOLITER SOLUTION DEPOSITION FOR TXRF ANALYSIS OF SEMICONDUCTOR SAMPLES

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In the semiconductor industry, there are steps in the manufacturing process where trace metal contamination on the silicon wafer needs to be controlled down into the 10^{09} atoms/cm² range thus requiring a technique with detection limits at the 10^{08} atoms/cm² level. One analytical method for achieving these low limits is vapor phase decomposition (VPD) as a sample preparation procedure to concentrate the contamination from the entire wafer into one discrete sample which is then analyzed as a solution by inductively coupled plasma mass spectrometry (ICP-MS) or as a dried residue by total reflection X-ray fluorescence (TXRF). This study follows in the path of earlier successful studies where nanoliter quantities of solution were deposited on silicon wafers to simulate the dried VPD residue^{1,2}. With the advancement in inkjet deposition technologies it is possible to deposit picoliter quantities of solution on a wafer. An HP Thermal Inkjet Pico-fluidic System (TIPS) is used to deposit picoliter volumes of solution onto silicon wafers. The array deposits provide a capability of depositing closely spaced (100 micrometers or less), typically 10-20 micrometer droplets in a multi-droplet array. This deposition approach increases reproducibility of the deposition, insures thin film formation of the dried residue and offers the potential of increased accuracy for TXRF measurements of semiconductor samples. By matching the size of the array to the analytical x-ray spot, there is an increase in signal to noise and reduction in error.

The authors thank Hewlett Packard Company for the loan of the TIPS device and their collaboration in developing this technology for analytical applications. TIPS is a prototype laboratory device used internally at HP and with selected research partners.

1. C. M. Sparks et.al. *Spectrochimica Acta B* 61, 2006, 1091-1097
2. U. E. A. Fittschen, et al. *Anal. Chem.*, in press, 2008.

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Oral presentation in the Trace analysis XRF session would be appropriate

Not planning on publishing in DXC proceedings since the previous literature has been captured in Spectrochimica Acta B, we'd like to continue it there.