SYNCHROTRON RADIATION INDUCED TOTAL REFLECTION X- RAY SPECTROMETRY OF LOW Z ELEMENTS ON SI WAFER SURFACES AT SSRL, BEAMLINE 3-3: COMPARISON OF DROPLETS WITH SPIN COATED WAFERS

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Semiconductor industry requires nondestructive investigation of low Z contaminations on Si wafer surfaces at trace levels. Synchrotron radiation induced TXRF fulfils this requirements Synchrotron radiation provides a high incident flux with low divergence and a linearly polarized beam resulting in increased fluorescence signals while reducing the elastically scattered background. Exploiting the tunability of the broad band synchrotron radiation allows in addition to efficiently excite low Z elements by choosing an excitation energy below the Si K absorption threshold. Experiments have been performed at SSRL Beamline 3-3, a bending magnet beamline, using monochromatic radiation from a double multilayer monochromator. The wafer was mounted vertically in the beam and a Si/Li detector having AP1 window was aligned along the polarization vector of the synchrotron radiation to collect a large solid angle of the emitted fluorescent radiation. We analyzed a wafer intentionally contaminated by a Na droplet and a Mg droplet (50pg) as well as a spin coated wafer having a Na and Mg concentration of (E12, E13, E14 atoms/cm2) in order to compare the features of VPD-TXRF with straight TXRF. Detection limits in the range of 50 fg for droplet samples and 2E10 atoms/cm^2 for the spin coated have been obtained verifying the inspected area deduced from the geometric arrangement of the area seen by the detector and illuminated area. In addition, we demonstrate that Boron can be efficiently detected with TXRF despite its low fluorescence yield. Due to the limited tuning range of the multilayer monochromator, the multilayers were used as a cut-off mirror reflecting the low energy continuum up to the carbon edge onto the sample resulting in a high excitation cross-section for Boron. Results of the experiments will be presented.