

INVESTIGATION OF SPIN-COATED INORGANIC CONTAMINATION ON SI SURFACES BY VARIOUS ANALYTICAL TECHNIQUES

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The development and assessment of new methodologies and metrologies for the detection of low level inorganic contaminants on and in silicon as well as for novel materials has been a major topic for the European Integrated Activity of Excellence and Networking for Nano- and Micro-Electronics Analysis (ANNA), www.ANNA-i3.net. The comparison of various analytical techniques available has been of decisive importance. The assessment of improved instrumentation as well as the reliability of quantification procedures of certain analytical techniques such as TXRF analysis has been also included. An extended set of 200 mm wafers was manufactured by MEMC and controlled in terms of residual surface metal content in order to ensure good initial surface conditions. The spin coating of this wafer set was performed with 3 target contamination levels ranging from 10^{10} cm⁻² to 10^{12} cm⁻² for various transition metals (Ti, Fe, Ni, Cu, and Mo) and, at 10 times higher depositions, for two light elements (Na and Al). The set of contaminated wafers were analysed by different analytical techniques such as X-ray tube and SR based TXRF, VPD-ICPMS, TOF-SIMS and VPD-AAS at different installations of the participating ANNA partners. VPD-GF AAS experiments as well as VPD-ICPMS analyses were performed on selected wafers confirming that the spin coating deposition met in average the intended contamination levels for both light elements and all metals. However, the scattering of the results obtained by the other analytical methods providing only local contamination information indicate only partial matching of different techniques at the intended contamination levels of metals and light elements. Causes for this behaviour are identified and addressed. One can conclude, that the different analytical methods employed require further cross-calibrations by orthogonal analytical techniques in ongoing works aiming on reliable and standardized analytical results of inorganic contamination on Si surfaces.

References:

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