

RAPID WHOLE-SURFACE ANALYSIS OF SEMICONDUCTORS BY THE USE OF TXRF

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TXRF with no chemical preconcentration, often called “Straight-TXRF,” is now widely used in the semiconductor industry. The small detection area of TXRF enables elemental mapping of a semiconductor surface, which is very useful in process characterization. However, the small detection area had been believed to limit rapid whole-surface analysis. Contrary to this supposition, we demonstrate that a new method, called “Sweeping-TXRF,” which is essentially short-time multi-point mapping by Straight-TXRF, can rapidly provide an average concentration. A substantial problem presented by this method is the contribution of errors in counting statistics, glancing angle, and areal element distribution to the fluorescence. Using statistics, we examine the errors and demonstrate that most of them are cancelled out and are not significant in actual semiconductor applications. Experimental results for locally contaminated wafers also support the above conclusion. Applying Sweeping-TXRF to existing TXRF instruments is simple — the only requirement is a small software modification. We believe that Sweeping-TXRF can be utilized for rapid whole-surface analysis of semiconductors.