TXRF TO MONITOR FOR HIGH K DIELECTRIC MATERIAL CONTAMINATION IN A SEMICONDUCTOR FAB

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As new materials are introduced into semiconductor device manufacturing lines, analytical techniques must be developed or modified to insure the ability to measure any contamination that may arise. Recently, ZrO_2 films were introduced as a high k gate dielectric (testing the feasibility of replacing SiO_2) in the manufacturing line of International SEMATECH. Prior to introduction of this new material, a majority of the process tools in the fab were baselined for elemental contamination with monitor wafers. The baseline covered zirconium as well as other metals that are potential candidates for a high k gate dielectric.

Vapor phase decomposition inductively coupled plasma mass spectroscopy (VPD-ICP-MS) was initially used as the analytical technique to monitor for elemental contamination on the wafers as it had the required sensitivity and a reasonable sample throughput. As baselining activities increased, a search for alternative techniques to improve sample throughput was conducted. To streamline the contamination monitoring, a TXRF, equipped with a silver tube anode as well as a tungsten rotating anode, was purchased. The Ag K α line at 22.101 keV from the silver anode is ideally suited for zirconium analysis (Zr adsorption edge = 17.998 keV).

Comparison of data collected by both TXRF and VPD-ICP-MS will be shown. Discussion of the relative merits of each technique will also be presented.