

MONITORING OF PHOSPHOROUS LEVELS IN VARIOUS PROCESS STEPS BY TXRF IN SEMICONDUCTOR MANUFACTURING

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In semiconductor processing, phosphorous is a very important element influencing device parameters. For example, it is commonly used as n-type dopant as in doped polysilicon. Phosphorous is incorporated in polysilicon during deposition process in the furnace. Resistivity of polysilicon is controlled by accurately doping and subsequent activation by heat treatment. Therefore it is important to monitor the doping level during the manufacturing steps, preferably in the fab.

TXRF has been used in our fab to monitor the phosphorous level. Although TXRF is normally used to monitor trace contamination and phosphorous levels can reach about 0.1%, this technique offers good sensitivity for phosphorous measurement, particularly for obtaining P to Si ratio. This provides a way to maintain control of process parameters. SIMS analysis were also done to correlate the quantitative data obtained by TXRF. After the dopant activation, resistivity data were obtained by 4-point probe.