Claims

1. A method for correcting misregistration measurements of a semiconductor wafer for errors therein arising from tilt of said wafer comprising:

measuring, for at least one location on a wafer, a difference between a Tool Induced Shift (TIS) of a metrology device in a first illumination arrangement with respect to said wafer wherein a surface of said wafer is generally orthogonally illuminated by an illumination source of said metrology device and a TIS of said metrology device in a second illumination arrangement with respect to said wafer, wherein said surface is obliquely illuminated by said illumination source; and

correcting a misregistration measurement measured by said metrology device at said at least one location for errors therein arising from tilt of said wafer at said location by subtracting from said misregistration measurement a weighted value of said difference between said TIS in said first and second illumination arrangements, wherein said difference between said TIS in said first and second illumination arrangements comprises a signature profile varying as a function of a parameter of said metrology device, wherein said metrology device illuminates said wafer by a multiplicity of wavelengths and said difference in TIS of said metrology device is measured as a function of said multiplicity of wavelengths, wherein said measuring said difference in TIS is performed at a plurality of locations N_s on said wafer and said difference in TIS of said metrology device is measured as a function of said multiplicity of wavelengths for each of said plurality of locations, and wherein said weighted value of said difference between said TIS in said first and second illumination arrangements is calculated by multiplying said difference between said TIS in said first and second illumination arrangements by a weighting coefficient.

2. The method according to claim 1, wherein said weighting coefficient is calculated based on only variable parts of said misregistration measurement and said difference between said TIS in said first and second illumination arrangements.

3. The method according to claim 2, wherein said weighting coefficient is calculated in accordance with

$$\alpha(\mathrm{N_s}) = \frac{\sum_\lambda \widetilde{MIS}_{\mathrm{measured}}(\mathrm{N_s},\lambda)\cdot \widetilde{\Delta TIS}\ (\lambda)}{\sum_\lambda \widetilde{\Delta TIS}^2(\lambda)}$$

wherein $\alpha(\mathrm{N_s})$ is said weighting coefficient, $\widetilde{MIS}_{\mathrm{measured}}(\mathrm{N_s},\lambda)$ is said variable part of said misregistration measurement and $\widetilde{\Delta TIS}\ (\lambda)$ is said variable part of said difference between said TIS in said first and second illumination arrangements.

4. The method according to claim 3, wherein said variable part of said misregistration measurement in calculated in accordance with:

$$\widetilde{MIS}_{\mathrm{measured}}(\mathrm{N_s},\lambda) = \mathrm{MIS}_{\mathrm{measured}}(\mathrm{N_s},\lambda) - \overline{\mathrm{MIS}_{\mathrm{measured}}(\mathrm{N_s})}$$

wherein $\mathrm{MIS}_{\mathrm{measured}}(\mathrm{N_s},\lambda)$ is said misregistration measurement and $\overline{\mathrm{MIS}_{\mathrm{measured}}(\mathrm{N_s})}$ is said misregistration measurement averaged over said multiplicity of illumination wavelengths.

5. The method according to claim 4, wherein said subtracting from said misregistration measurement said weighted value of said difference between said TIS in said first and second illumination arrangements is performed in accordance with:

$$\mathrm{MIS}_{\mathrm{corrected}}(\mathrm{N_s}) = \mathrm{MIS}_{\mathrm{measured}}(\mathrm{N_s},\lambda) - \alpha(\mathrm{N_s})\cdot \Delta TIS\ (\lambda)$$

wherein $\mathrm{MIS}_{\mathrm{corrected}}(\mathrm{N_s})$ is a corrected value of said misregistration measurement and $\Delta TIS\ (\lambda)$ is said difference between said TIS in said first and second illumination arrangements.

6. A system for correcting misregistration measurements on a semiconductor wafer for errors therein arising from tilt of said wafer comprising:

an illumination source forming part of a metrology device and operative to illuminate a wafer in at least a first illumination arrangement wherein a surface of said wafer is generally orthogonally illuminated by said illumination source and a second illumination arrangement wherein said surface is obliquely illuminated by said illumination source;

a Tool Induced Shift (TIS) calculator operative to find a difference between a TIS of said metrology device in said first and second illumination arrangements; and

a wafer tilt corrector operative to correct a misregistration measurement by said metrology device at a location on said wafer for errors therein arising due to tilt of said wafer at said location, based on subtracting from said misregistration measurement a weighted value of said difference between said TIS of said metrology device in said first and second illumination arrangements, wherein said difference between said TIS in said first and second illumination arrangements comprises a signature profile varying as a function of a parameter of said metrology device, wherein said illumination source is operative to illuminate said wafer by a multiplicity of wavelengths and said TIS calculator is operative to find said difference in TIS of said metrology device as a function of said multiplicity of wavelengths, wherein said TIS calculator is operative to find said difference in TIS at a plurality of locations N_s on said wafer, as a function of said multiplicity of wavelengths for each of said plurality of locations, wherein said wafer tilt corrector is operative to calculate said weighted value of said difference between said TIS in said first and second illumination arrangements by multiplying said difference between said TIS in said first and second illumination arrangements by a weighting coefficient.

7. The system according to claim 6, wherein said wafer tilt corrector is operative to calculate said weighting coefficient based on only variable parts of said misregistration measurement and said difference between said TIS in said first and second illumination arrangements.

8. The system according to claim 7, wherein said wafer tilt corrector is operative to calculate said weighting coefficient in accordance with:

$$\alpha(\mathrm{N_s}) = \frac{\sum_\lambda \widetilde{MIS}_{\mathrm{measured}}(\mathrm{N_s},\lambda)\cdot\widetilde{\Delta TIS}\ (\lambda)}{\sum_\lambda \widetilde{\Delta TIS}^2(\lambda)}$$

wherein $\alpha(\mathrm{N_s})$ is said weighting coefficient, $\widetilde{MIS}_{\mathrm{measured}}(\mathrm{N_s},\lambda)$ is said variable part of said misregistration measurement and $\widetilde{\Delta TIS}\ (\lambda)$ is said variable part of said difference between TIS in said first and second illumination arrangements.

9. The system according to claim 8, wherein said wafer tilt corrector is operative to calculate said variable part of said misregistration measurement in accordance with:

$$\widetilde{MIS}_{\mathrm{measured}}(\mathrm{N_s},\lambda) = \mathrm{MIS}_{\mathrm{measured}}(\mathrm{N_s},\lambda) - \overline{\mathrm{MIS}_{\mathrm{measured}}(\mathrm{N_s})}$$

wherein $\mathrm{MIS}_{\mathrm{measured}}(\mathrm{N_s},\lambda)$ is said misregistration measurement and $\overline{\mathrm{MIS}_{\mathrm{measured}}(\mathrm{N_s})}$ is said misregistration measurement averaged over said multiplicity of illumination wavelengths.

10. The system according to claim 9, wherein said wafer tilt corrector is operative to subtract from said misregistration measurement a weighted value of said difference between said TIS in said first and second illumination arrangements in accordance with:

$$\mathrm{MIS}_{\mathrm{corrected}}(\mathrm{N_s}) = \mathrm{MIS}_{\mathrm{measured}}(\mathrm{N_s},\lambda) - \alpha(\mathrm{N_s}) \cdot \Delta TIS\ (\lambda)$$

wherein $\mathrm{MIS}_{\mathrm{corrected}}(\mathrm{N_s})$ is a corrected value of said misregistration measurement and $\Delta TIS\ (\lambda)$ is said difference between said TIS in said first and second illumination arrangements.

11. The method according to claim 1, further comprising optimizing an operating parameter of said metrology device based on said difference in TIS of said metrology device.

12. The system according to claim 6, wherein an operating parameter of said metrology device is optimized based on said difference in TIS of said metrology device.