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Systematic errors for a Mueller Matrix Ellipsometer



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We present the influence of systematic errors due to azimuth errors of the optical elements for a MME. This ellipsometer is based on the dual rotating-compensator principle in the PC1SC2A configuration developed by Collins. The first and secondorder systematic errors have been characterized for all elements of the 4×4 normalized Mueller matrix and for the Jones matrix elements $\tan \Psi_{pp}$ and Δ_{pp} . We show that these errors can be eliminated by a four zone measurement technical.



The possible azimutal errors δA , δP , δC_{S1} and δC_{s_2} induce errors both for the Mueller matrix coefficient δm_{ii} and for the Jones matrix elements $\delta tan \Psi_{xy}$ and $\delta \Delta_{xy}$.

Overview from the errors δm_{ii} for all m_{ii} coefficients according to the azimutal errors of the analyzer and polarizer δA, δP and of the shift angles errors δC_{S1} , δC_{S2}.

These measurements has been performed on a 106 nm - SiO₂/Si sample at $\lambda = 633$ nm and 70° of incidence.

The errors have a symmetrical distribution between (A,P)and between (C_{S1}, C_{S2}) the due to symmetrical configuration of the MME.

> (δm_{ii})_{(A,F}



Behavior of the δm_{22} due to both δC_{S1} and





systematic errors on ρ_{pp} have been characterized for this isotropic sample









Conclusion

We have shown the effect of the systematic errors on the Mueller matrix coefficients m_{ii} for a MME due to bad azimutal positions of the optical elements.

- Some m_{ii} coefficients cannot be cancelled but for the another a four-measurement zone method is proposed.
- \Rightarrow The errors due to bad shift angles δC_{Si} are greater than errors due to shift angles δA and δP .
- ⇒ For an isotropic sample, only a two-measurement zone with A = P = $\pm 45^{\circ}$ eliminate the errors on ρ_{pp} .