Ellipsometry with randomly varying polarization states: errata

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Abstract: We show that, under the right conditions, one can make highly accurate polarization-based measurements without knowing the absolute polarization state of the probing light field. It is shown that light, passed through a randomly varying birefringent material has a well-defined orbit on the Poincaré sphere, which we term a generalized polarization state, that is preserved. Changes to the generalized polarization state can then be used in place of the absolute polarization states that make up the generalized state, to measure the change in polarization due to a sample under investigation. We illustrate the usefulness of this analysis approach by demonstrating fiber-based ellipsometry, where the polarization state of the probe light is unknown, and, yet, the ellipsometric angles of the investigated sample (Ψ and Δ) are obtained with an accuracy comparable to that of conventional ellipsometry instruments by measuring changes to the generalized polarization state.

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References and links

1. F. Liu, C. J. Lee, J. Chen, E. Louis, P. J. M. van der Slot, K. J. Boller, and F. Bijkerk, "Ellipsometry with randomly varying polarization states," Opt. Express **20**(2), 870–878 (2012).

1. Correction

We recently discovered several sign-errors in our paper, published in [1]. Affected are Eqs. (1), (6), and (7). These equations, with the errors corrected, are reproduced below as Eqs. (1)–(3), respectively. Due to the nature of our fitting program, these sign errors have not had an effect on our experimental results.

$$M = A \cdot \begin{bmatrix} 1 & -\cos 2\Psi & 0 & 0 \\ -\cos 2\Psi & 1 & 0 & 0 \\ 0 & 0 & \sin 2\Psi \cos\Delta & \sin 2\Psi \sin\Delta \\ 0 & 0 & -\sin 2\Psi \sin\Delta & \sin 2\Psi \cos\Delta \end{bmatrix} \tag{1}$$

$$R_3 = A\sin(2\Psi)(I_3\cos\Delta + I_4\sin\Delta) \tag{2}$$

$$R_4 = A\sin(2\Psi)(I_4\cos\Delta - I_3\sin\Delta) \tag{3}$$

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