Single-shot phase measurement for micro & nano regimes based on carrier frequency concept

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Abstract

We describe what we believe to be a new digital holographic configuration that can be utilized for both single-shot dual-wavelength off-axis geometry and imaging polarimetry. For getting the feasibility of the single-shot dual-wavelength off-axis geometry, a sample with a nominal step height of 1.34 μm is used. And also, the experiment is conducted on a nanopattern sample on the basis of a single image acquisition for showing the imaging polarimetry capability. The proposed scheme can provide a real time solution for measuring three-dimensional (3D) objects having high abrupt height difference with moderate accuracy. Furthermore, it can be used as a fast polarization imaging measurement tool.

Spectroscopic ellipsometry is one of the most important measurement schemes used in the optical nano-metrology for not only thin film measurement but also nano pattern 3D structure measurement. We propose a novel snap shot phase sensitive normal incidence spectroscopic ellipsometic scheme based on a double-channel spectral carrier frequency concept. The proposed method can provide both $\Psi(\lambda)$ and $\Delta(\lambda)$ only by using two spectra acquired simultaneously through the double spectroscopic channels. We show that the proposed scheme works well experimentally by measuring a binary grating with nano size 3D structure. We claim that the proposed scheme can provide a snapshot spectroscopic ellipsometric parameter measurement capability with moderate accuracy.