White Light Channeled Spectrum Interferometry for the On-line Surface Inspection

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Abstract

In the industries making high volume as well as large area foil products and flexible electronics, the deposition and patterning of multi-layer thin films on large area substrates is often involved in the manufacturing processes. For these types of product, the films must be uniform and largely perfect across most of the area of the foil. To achieve a high product yield, the key challenge is to inspect the foil surface at production speed as well as have the sufficient resolution to detect the defects resulting from the coating and patterning processes. After the effective inspection, further process like local repair technique can be applied to remove the defects.

We present a white light channeled spectrum interferometry (WLCSI) method that is effective for applications in on-line surface inspection because it can obtain a surface profile in a single shot. It has an advantage over existing spectral interferometry techniques by using cylindrical lenses as the objective lens in a Michelson interferometric configuration to enable the measurement of long profiles. The adjustable profile length in our experimental setup, determined by the NA of the illuminating system and the aperture of cylindrical lenses, is up to 10 mm. By translating the tested sample during the measurement procedure, fast and large-scale on-line surface inspection can be achieved.

The performance of the WLCSI was evaluated experimentally by measuring step heights. The measuring results closely align with the calibrated specifications given by the manufacturer as well as the measurement results by the other commercial instrument, which demonstrate that the proposed WLCSI could be applied to production line like the R2R surface inspection, where only defects on the film surface are concerned in terms of the quality control.

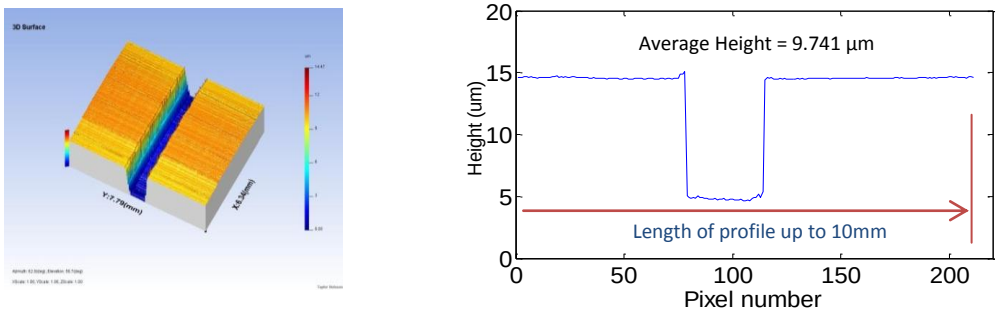

Figure 1. Measurement results: 3D surface map and 2D profile plot of a sample with the height of 9.759 µm

Reference

1. Jeffrey D. Morse (2011) 'Nanofabrication Technologies for Roll-to-Roll Processing'. Report from the NIST-NNN Workshop
2. Dawei Tang, Feng Gao and X. Jiang (2014) 'Cylindrical Lenses Based Spectral Domain Low-Coherence Interferometry for On-line Surface Inspection'. *In: Proceedings of the 14th euspen International Conference, 2 - 6 June 2014*, Dubrovnik, Croatia