Imaging Ellipsometry at the air/water interface

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Conventional ellipsometry is well established in the field of thin film metrology due to the exceptionally high resolution in the z-axis, enabling very accurate thickness measurements for nano- and microfilms. However, conventional ellipsometry does not have a sufficient lateral resolution for a number of current developments nor a direct microscopic visualization with highest contrast for thin films. The approach of Imaging Ellipsometry (SIE) differs from conventional ellipsometry in that the measurements are based on a series of micrographs taken at dedicated orientations of the optical components. The primary measurements are microscopic maps of the ellipsometric angles Delta and Psi. The data were transferred into thickness maps by optical modelling (EP4_model software package, Accurion). In literature, maps of ellipsometric parameters at the air water interface were for example reported by Rottke et al.[1].

Microscopic Delta and Psi maps were recorded with a single wavelength imaging ellipsometer, equipped with a red laser ($^{IE}EP4_{L658nm}$). The instrument was mounted on a Halcyonics_vario40 active vibration isolation system on top of a halcyonics support frame. A water-filled round Teflon trough equipped with a wedge shaped black glass plate was used. Droplets of a Ethylstearate (solution of 1 mg/ml in Hexane) were spread with a microliter syringe at a cleaned water surface. Delta and Psi maps were recorded continuously with maximum speed at the laser wavelength of 658 nm and an angle of incidence of 50°.

The experimental results are discussed in the context of new developments in the field of Gibbs, LB and related thin films at the air water interface.

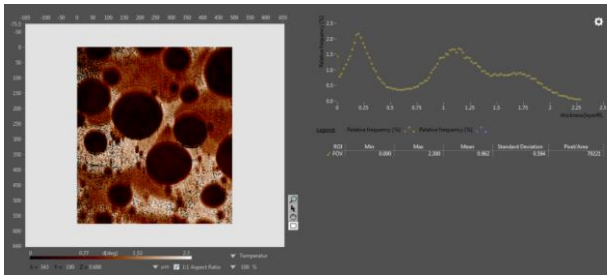

Fig. 1. Ethyl stearate film at the air water interface without compression - Delta map and distribution of Delta values.

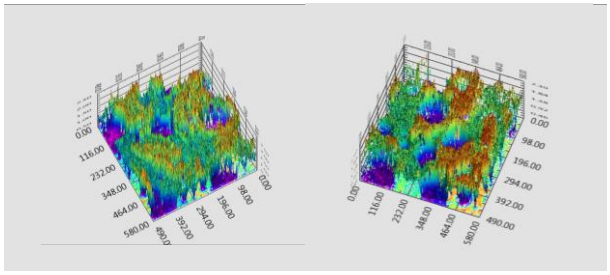

Fig.2. Thickness maps of the Ethyl stearate films at the air/water interface.

Air/Water interface, Imaging ellipsometry, active vibration isolation

References

[1] F.O. Rottke, B. Schulz, K. Richau, K. Kratz, A. Lendlein, Beilstein J. Nanotechnol. 2016, 7, 1156–1165.