Application Note

Fries Research & Technology
Rauheit Kontur Topographie

Measurement of thin transparent films on wafers

Measuring task:

Hybrid polymers are deposited as thin transparent films on wafers (Fig. 1). The film thickness is to be measured. As the film has been partially removed, the film thickness could be determined from a profile across the wafer surface and film upper surface. Thickness would equal height difference.

Challenges:

Conventional contact stylus measuring systems are unsuitable for this application, as they use mechanical contact techniques and scratch the soft surfaces being measured.

Non-contact, optical measuring systems using confocal, auto focus or triangulation sensors fail for the profile measurement on thin, transparent films, as the reflected light from the film upper and lower surfaces cannot be individually evaluated.

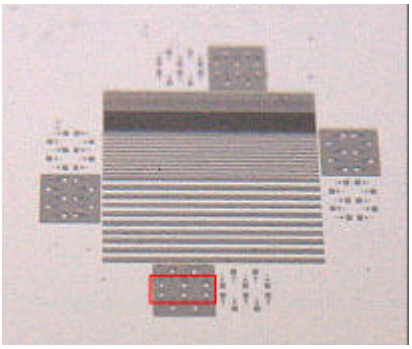


Fig. 1: Photo of the partially removed polymer layer

The solution:

The FRT MicroProf® with the interferometric film thickness sensor.

The sensor measures the light reflected from each of the film surfaces and determines for each wavelength the interference of the two light beams. Thickness can be measured in a range up to 200 µm with high resolution.

In the MicroProf® TM the interferometric measurement enables highly resolved 3D mapping of a layer thickness. The MicroProf® TM can be further upgraded to a two-sensor combination system: the interferometric sensor and the confocal, chromatic distance sensor. This powerful system rapidly measures both, film thickness and surface topography, with highest local thickness / height resolution.

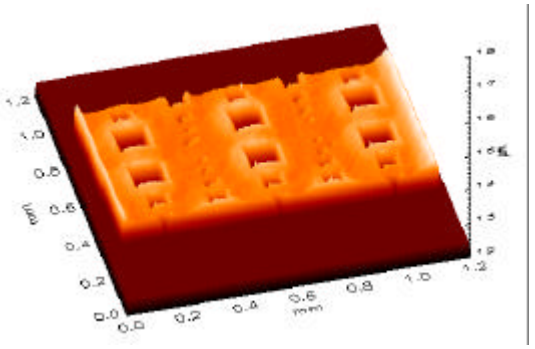


Fig. 2: 3D-view of the layer thickness

The 3D –view in fig. 2 shows a section of the measured polymer layer. The film thickness and not the height of the surface is shown in the z-height direction. The quadratic structures show clearly where the film has been removed.

The measured film thickness is evaluated by the FRT Mark III analysis software. This powerful package is used in all FRT measuring systems for the presentation and evaluation of topography- and film thickness data.

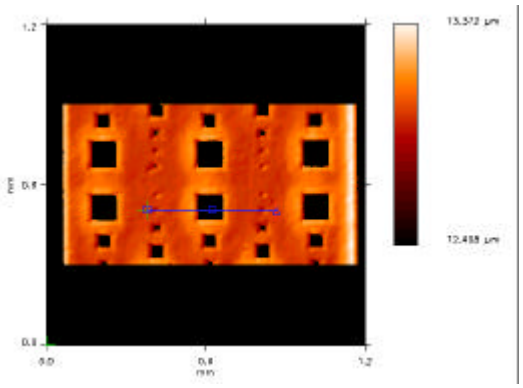


Fig. 3: Top view of the layer thickness with profile inserted

Fig. 3 shows the top view of the film with a profile inserted for evaluation. The film thickness variation along this profile is shown in fig. 4

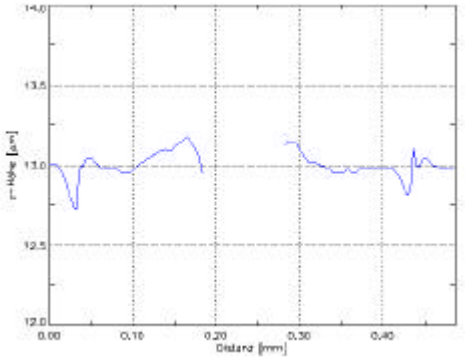
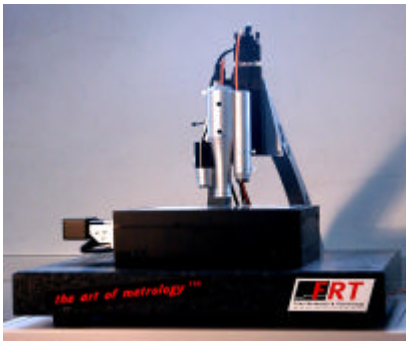


Fig. 4: Thickness along the profile selected in Fig. 3

The interferometric film thickness sensor can be integrated into all FRT MicroProf® and FRT MicroGlider® systems.

The FRT MicroProf® TM (see picture) combined with the confocal, chromatic distance sensor, performs not only the described film thickness measurement but also high resolution topography and profile measurements in one system.



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