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Hyperspectral Imaging a novel inline-capable tool for spatially resolved inspection of thin films

Wulf Grählert, Philipp Wollmann, Oliver Throl, Florian Gruber, Stefan Kaskel

Fraunhofer IWS, Dresden, Germany

wulf.graehlert@iws.fraunhofer.de

The reliable knowledge of surface and thin film properties is essential in the development of thin film processes as well as in the quality assurance in their industrial production and applications. Beside common single point measurements the need of a 100% inspection of the whole sample area is nowadays increasingly important. Hyperspectral imaging (HSI) opens the easy and fast access to spatial resolved large area measurement of a variety of properties of thin film samples. The optical and therefore contactless approach enables furthermore the inline application of the HSI technology.
Versatile applications can be addressed by a broad spectral range, which covered UV, VIS and NIR. Depending of the target objectives of the measurement, dedicated strategies of data analysis are used. Hard-modelling approaches based on fundamental physical laws enable the imaging of thin film thickness, the imaging of optical properties or imaging of the sheet resistance. Soft-modelling approaches like multivariate data analysis leads to the fast detection of surface impurities e.g. contaminations like particles or of target sample properties e.g. the adhesion strength of plasma treated surfaces. The flexibility in system setup by hardware (detector, optics, and lighting) and software (data analysis algorithms) enables tailored solutions for dedicated inspection tasks.
The technology of Hyperspectral Imaging will be illustrated by means of certain examples from the thin film sectors: Thickness imaging of ALD thin films, Sheet resistance imaging of TCO coated substrates, Imaging of adhesive strength of plasma treated surfaces, Contamination detection on surfaces, Evaluation of decoating processes (laser scribing)
Finally, the possibility of an inline inspection by HSI will be demonstrated exemplary by the continuous quality control of an alumina layer in electrode manufactory.

Keywords
thin film analytics
in-line inspection
hyperspectral imaging
multivariate data analysis