

Quality Control of Slot-Die Coated Aluminum Oxide Layers for Battery Applications Using Hyperspectral Imaging

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Hyperspectral inspection using imaging systems is becoming more and more important for quality control tasks in several industries, replacing well trained operators or established machine vision systems based on RGB-systems. Hyperspectral imaging (HSI) on thin coated substrates is challenging due to the high reflectivity of the substrates. Nevertheless, the thin films contribute to the spectral data and can be evaluated. Therefore, the performance of inspection systems can be increased significantly. However, the large amount of data generated by HSI has to be processed and evaluated for quality information about the product. In this paper, thin aluminum oxide (Al_2O_3) layers on stainless steel foil are investigated by HSI. These substrates can be used for the growth of vertically aligned carbon nanotubes (VA-SWCNT) for battery electrodes. HSI and spectral ellipsometry in combination with Partial Least Squares regression (PLS) was used to estimate the thickness of the Al_2O_3 layers and to calculate quality parameters for a possible monitoring process. The PLS model shows a R^2_{CV} of 0.979 and a RMSECV of 3.6.

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