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Wavelength Scanning Interferometry for large area roll to roll metrology applications in photovoltaic manufacturing environment

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Introduction
The wavelength scanning interferometer is currently being applied as a core metrology technology as part of the EU project NanoMend - Nanoscale Defect Detection, Cleaning and Repair for Large Area Substrates, 500 mm width.

NanoMend Project Aim: To develop technologies that are able to detect and correct micro and nano-scale defects in roll-to-roll produced films in order to improve product performance, yield and lifetime.

On-line inspection of film layers at CPI.
As part of the NanoMend project, the WSI system will be implemented as the sensor technology in a proof-of-concept on-line inspection unit at the UK Catapult - Centre for Process Innovation (CPI). A roll-to-roll re-winder unit will run the coated barrier film (450 mm width) past the WSI sensor. An air-bearing foil handling system in conjunction with the WSI vibration compensation system will enable measurement on the flexible substrate.

Experimental Work: Defect detection and characterisation on film layers.
Static measurements on ALD coated barrier film samples have established the capability of the WSI measure relevant defects.

• 30 µm hole detected in film layer by the WSI.
• Defect topography retrieved and analysed.

Challenge
• Defect detection in roll-to-roll vapour barrier layers for flexible photo-voltaic (PV) cells based on active Copper indium gallium selenide (CIGS) technology.
• 40 – 100 nm thick layer of Al₂O₃ deposited onto polymer using atomic layer deposition (ALD) process.
• Defects in the barrier layer reduce PV cell lifespan as the active layers are compromised.
• Metrology of the generated barrier essential for understanding the process and determining critical defects.