

	CHALLENGES	SOLUTIONS
Chemical Analysis / Spectroscopy	<ul style="list-style-type: none"> Identify chemicals and study degradation Determine molecular weight of polymers for device fabrication Study glass transitions for optimal process temperatures Chemical and thermal analysis of organic material; Polymer temperature rating Qualitative chemical measurements Optical properties of materials Estimation of carrier concentration in TCOs LED spectral performance Surface height/roughness; accuracy of manufacturing steps 	<ul style="list-style-type: none"> ✓ Fourier Transform Infrared Analysis ✓ Gel Permeation Chromatography ✓ Differential Scanning Calorimetry ✓ Thermal Gravimetric Analysis ✓ Wet Chemical Analysis ✓ UV-Visible-IR optics spectrometer ✓ Atomic Force Microscope
Device / Internal Analysis	<ul style="list-style-type: none"> Visible inspection of defects/failures Large area cross section cutting, large area patterning Removal of organic compounds/surface cleaning Device characterisation Cross sectional analysis, circuit editing Multiple low noise electrical measurements Depth profiling, identifying contaminants/impurities Surface cleaning, surface mapping of elements 	<ul style="list-style-type: none"> ✓ High Magnification Optical Microscopes ✓ Laser Isolation/patterning equipment ✓ Plasma Etcher ✓ Probe Stations for Device Characterisation ✓ Class 'A' solar simulator and light soakers ✓ Focussed Ion Beam/SEM ✓ Switch Matrix ✓ TOF-SIMS
Electrical / Electronic Test	<ul style="list-style-type: none"> Low noise IV measurements Gate dielectric, contacts, carrier transport properties Automated, multiple low noise electrical measurements 	<ul style="list-style-type: none"> ✓ Agilent Femto-Amp resolution parameter analysers ✓ RLC bridges impedance measurements ✓ Automated Test Equipment
Environmental Testing	<ul style="list-style-type: none"> Accelerated tests UV degradation Testing for delamination, yellowing, cracking, colour change 	<ul style="list-style-type: none"> ✓ Outdoor test rigs for solar modules ✓ Weather station and irradiance sensor ✓ Environmental Chambers ✓ Light soaking
Electron Microscopy/ Surface Analysis	<ul style="list-style-type: none"> External visual inspection for cracks/failures/defects Elemental analysis Gate oxide properties, semiconductor surface structure Work function calculations Molecular ordering Optical constants, non-destructive change to optical properties Cross sectional analysis, failure analysis 	<ul style="list-style-type: none"> ✓ Field Emission Scanning Electron Microscopy ✓ Energy Dispersive X-ray Spectroscopy ✓ Atomic Force Microscopy ✓ Kelvin probe microscopy ✓ X-ray Diffraction ✓ Ellipsometry ✓ Focussed Ion Beam (via partner)
Materials Processing	<ul style="list-style-type: none"> Fabrication of Organic/unstable devices Patterning of interconnects Metallisation/dielectric deposition Electrical contact/dielectric/AR coating Electrical contact/dielectric/AR coating Step heights Surface roughness 	<ul style="list-style-type: none"> ✓ Vacuum Furnaces up to 600 C ✓ Photolithography ✓ 3-source sputter coater ✓ Electron Beam deposition ✓ Thermal evaporation of metals, organic materials ✓ Class 1000 cleanroom ✓ Atomic Force Microscope
Non-Destructive Analysis	<ul style="list-style-type: none"> Gate oxide properties, semiconductor surface structure Work function calculations Molecular ordering 	<ul style="list-style-type: none"> ✓ Probe station, surface analysis equipment - AFM ✓ Probe station, surface analysis equipment - KFM ✓ Probe station, surface analysis equipment - XRD
Electrostatic Testing	<ul style="list-style-type: none"> Surface resistivity measurement Charge Decay monitoring Field Meter measurement Conduction to ground monitoring Powder coating test set 	<ul style="list-style-type: none"> ✓ Surface resistivity measurement ✓ Charge Decay monitoring ✓ Field Meter measurement ✓ Conduction to ground monitoring ✓ Powder coating test set