ZSW PHOTOVOLTAICS

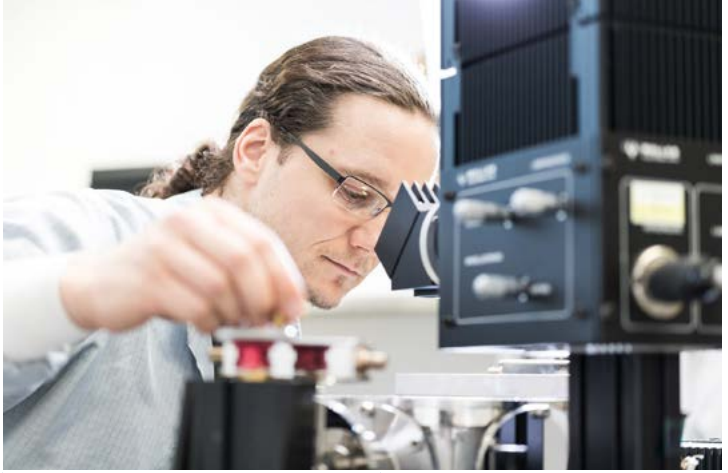
MATERIALS RESEARCH

Thin-film characterisation services

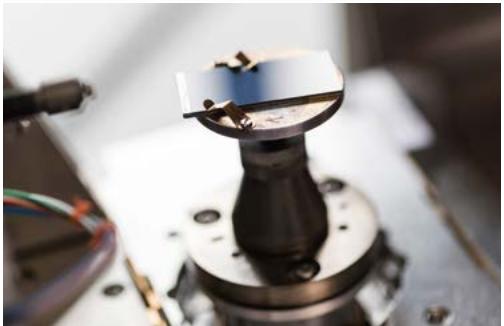
SMART MEASUREMENTS. DEEPER UNDERSTANDING.

Understanding materials is key to developing reliable technologies. We offer not only a broad range of advanced characterization techniques, but also the expertise to help you choose the methods that deliver the most value for your goals. From early-stage research to industrial application, we support you with tailored advice and deep material insight. Since 1988, our partners have trusted us to guide innovation across diverse fields through collaborative, knowledge-driven measurement services.

Materials Characterisation	Tool	Purpose
EDX Energy-Dispersive X-ray Spectroscopy	**Oxford Instruments** Be(4) - U(92)	High-spatial-resolution composition by electron-beam-excited x-ray analysis
FIB-SEM Focussed Ion Beam-Scanning Electron Microscope	**Zeiss Crossbeam 550** 1 nm resolution, 10 nm film thickness	High-resolution imaging and milling
GDOES Glow Discharge Optical Emission Spectroscopy	**Horiba GD Profiler 2** Element list available upon request	Depth profiles of composition by optical emission in plasma
Raman Spectroscopy	**S&I** (325, 442, 459, 488 nm) **WiTec Microscope** (532, 785 nm)	Phase identification by bond oscillations
ToF-SIMS Time-of-Flight Secondary Ion Mass Spectrometry	**IonTof TOF.SIMS 5** Analysis Bi^+, Sputter Cs^+, O_2^-, Ar cluster, O cluster; 200 nm lateral resolution, 6000 mass resolution, 1-2000 amu	Composition by mass spectrometry, depth profiles and 3D composition imaging
XPS X-ray Photoelectron Spectroscopy	**SPECS** Mg 1254 eV, Al 1487 eV and Cr 5417 eV	Surface elements and their chemical state
XRD X-ray Diffraction	**Panalytical – Empyrean** Cu-Kα, Bragg-Brentano or grazing incidence geometries	Phase identification by crystal structure
XRF X-ray Fluorescence	**Fischerscope X-ray XVD-SDD** Al(13) - U(92)	Composition and thickness of thin films
Optical/Optoelectrical Method	**Tool**	**Purpose**
OBIC, PL Mapping Optical Beam Induced Current, Photoluminescence	**Home-built tool**	Homogeneity of current generation, material quality
Optical microscope	**Zeiss Axio**	Identification of features, inspection of grid fingers and scribes
Optical spectroscopy UV-Vis-NIR with integrating sphere	**PerkinElmer Lambda 900** **Avantes AvaSpec**	Optical characteristics: transmission, reflection, scattering
Profilometry	**Keyence/Bruker DektakXT**	Optical/tacticle profilometry
Quantum Efficiency	**Bentham**	Spectral distribution of current generation and collection
Spectral Ellipsometry	**Sentech/Woolam**	Optical constants and film thickness for very thin flat films
TRPL Time-Resolved Photoluminescence	**PicoQuant FluoTime 300** **450 nm and 640 nm lasers**	Calculation of charge carrier lifetimes from photoluminescence decay



Electrical Characterisation Method	Tool	Purpose
CV Capacitance-Voltage	**Home-built tool**	Calculation of charge carrier concentration
DLIT Dark Lock-In Thermography	**Home-built tool with Thermo-sensorik IR camera**	Imaging method to localize short circuits and current leakage
DLTS Deep-Level Transient Spectroscopy	**PhysTech**	Defect characterization
EL Electroluminescence	**Andor i-Kon in darkbox**	Imaging method for localisation of regions and faulty contacts
Hall effect	**PhysTech RH 2010**	Calculation of charge carrier concentration and mobility
Low-Temperature Characterization	**ARS cryogenic probestation**	Temperature dependency and low-temperature characterization of e. g. IV, CV
Transient Current-Voltage-Capacitance	**Fluxim Paios**	In-depth electrical characterization of perovskite solar cells
Solar Simulators, IV Current-Voltage characterization	**Wacom** (1- or 2-lamp, up to 10 × 10 cm²) **ABET** (up to 30 × 30 cm²)	Calculation of solar parameters for cells or modules in substrate or superstrate configurations, temperature adjustable
Sheet resistance Four Point Probe Mapping	**Home-built tool** up to 30 × 30 cm²	Calculation of sheet resistance



Find out more about our services by scanning the QR Code.

Contact us
Dr.-Ing. Theresa Magorian Friedlmeier
Group Leader Analytics & Simulation
Photovoltaics: Materials Research

theresa.friedlmeier@zsw-bw.de
+49 711 7870 - 293

Zentrum für Sonnenenergie-
und Wasserstoff-Forschung
Baden-Württemberg (ZSW)
Meitnerstraße 1
70563 Stuttgart

www.zsw-bw.de

Photos: Alexander Fischer