

Materials List for:

# Comprehensive Characterization of Extended Defects in Semiconductor Materials by a Scanning Electron Microscope

Ellen Hieckmann<sup>1</sup>, Markus Nacke<sup>1</sup>, Matthias Allardt<sup>1</sup>, Yury Bodrov<sup>1</sup>, Paul Chekhonin<sup>2</sup>, Werner Skrotzki<sup>2</sup>, Jörg Weber<sup>1</sup>

<sup>1</sup>Institute of Applied Physics, Semiconductor Physics, Technische Universität Dresden

<sup>2</sup>Institut für Strukturphysik, Technische Universität Dresden

Correspondence to: Ellen Hieckmann at [ellen.hieckmann@tu-dresden.de](mailto:ellen.hieckmann@tu-dresden.de)

URL: <https://www.jove.com/video/53872>

DOI: [doi:10.3791/53872](https://doi.org/10.3791/53872)

## Materials

Name	Company	Catalog Number	Comments
Cryogenic liquids:	Linde <a href="http://www.linde-gas.de">http://www.linde-gas.de</a> , Air Liquide <a href="http://www.airliquide.de/">http://www.airliquide.de/</a>		
Liquid helium ( LHe )			for cooling of the cryostat
Liquid nitrogen ( LN2 )			for cooling of the PMT R5509-73
Indium wire	chemPUR <a href="http://chempur.de/">http://chempur.de/</a>	900898	CL sample preparation: for good electrical and thermal coupling between cryostat and sample
Mica	plano GmbH <a href="http://www.plano-em.de/">http://www.plano-em.de/</a>	V3	isolation of EBIC sample holder and good thermal coupling to the cryostat
Aluminium wire, gold wire	chemPUR <a href="http://chempur.de/">http://chempur.de/</a>	009013, 900891	purity 99.99%, material for formation of Schottky contact for EBIC measurements
Indium-Gallium eutectic solution	Alfa Aesar	12478	to form ohmic contact on the backside of the sample for EBIC measurements
Liquid chemicals VLSI Selectipur (de-ionized water, acetone, ethanol)	VWR	52182674, 51152090	for sample preparation: cleaning and surface treatment
Hydrofluoric acid	VWR	1,003,382,500	necessary to remove surface oxide layer on Silicon samples immediately before investigation; follow safety precautions!
MicroCloth	Buehler <a href="http://www.buehler.com/">http://www.buehler.com/</a>	40-7222	polishing cloth
MasterMet 1 (0.02 µm)	Buehler <a href="http://www.buehler.com/">http://www.buehler.com/</a>	40-6380-006	SiO <sub>2</sub> polishing suspension
Scanning electron microscope (SEM)	Carl Zeiss AG <a href="http://www.zeiss.de/microscopy/">http://www.zeiss.de/microscopy/</a>	Ultra 55	field emission gun
SEM-CL system	EMSystems		customized, following equipment belongs to CL system:
SEM stage for cryostat	Kammrath & Weiss <a href="http://www.kammrath-weiss.com">http://www.kammrath-weiss.com</a>		
KONTI cryostat	Cryovac <a href="http://www.cryovac.de/">http://www.cryovac.de/</a>	3-06-4609C-7674	cooling of sample
Liquid He transfer line for KONTI cryostat	Cryovac <a href="http://www.cryovac.de/">http://www.cryovac.de/</a>	3-01-3506C-SO	
Cryogenic Temperature Controller	Cryovac <a href="http://www.cryovac.de/">http://www.cryovac.de/</a>	TIC-304 MA	controlling the flow rate of cryogenic
Photomultiplier Tube (PMT)	Hamamatsu <a href="http://www.hamamatsu.com">http://www.hamamatsu.com</a>	R5509-73	for NIR spectral range
PMT housing and cooler	Hamamatsu <a href="http://www.hamamatsu.com">http://www.hamamatsu.com</a>	C9940-2	

HV power supply	Heinzinger electronic GmbH <a href="http://www.heinzinger.de/">http://www.heinzinger.de/</a>	LNC 3000-10 neg	for operating of the PMT
Monochromator	Sol Instruments Ltd. <a href="http://www.solinstruments.com">http://www.solinstruments.com</a>	MS2004i	
PMT	Hamamatsu <a href="http://www.hamamatsu.com">http://www.hamamatsu.com</a>	R3896	for visible spectral range
CCD digital camera	Proscan GmbH, Proscan Special Instruments Ltd. <a href="http://www.proscan.de">http://www.proscan.de</a>	HS 101 H	for visible spectral range
Control program	Proscan GmbH, Proscan Special Instruments Ltd. <a href="http://www.proscan.de">http://www.proscan.de</a>	PSI line	for controlling spectral CL measurements with CCD or PMT detectors
Laptop	Dell	Latitude 110L	hardware for running the control program
LHe dewar	cryotherm <a href="http://www.cryotherm.de/">http://www.cryotherm.de/</a>	Stratos 100 SL	container for cryogenic
LN2 dewar			container for cryogenic
Protective glasses	pulsafe		protective equipment
Protective gloves	tempex	Protect line Mod. 4081052	protective equipment
Heating tape	Thermocax Isopad GmbH <a href="http://www.isopad-solutions.com">http://www.isopad-solutions.com</a>	IT-TeMS 6	to prevent or reduce icing of the flexible hoses during cooling
Diaphragm pump	Vacuubrand GmbH & Co KG <a href="http://www.vacuubrand.com">http://www.vacuubrand.com</a>	ME4	to provide the flow rate of the cryogenic
Vacuum accessoires: flexible hoses, seals, locking rings			connectors for cryogenic CL or EBIC set-up
Specimen current EBIC amplifier	KE developments / Deben <a href="http://deben.co.uk/">http://deben.co.uk/</a>	Type 31	Measuring the EBIC current
High vacuum chamber with metal evaporation	customized		formation of Schottky contact for EBIC measurements
Heating plate	Retsch GmbH <a href="http://www.retsch.de">http://www.retsch.de</a>	SG1	CL sample preparation
EBSD detector Nordlys	HKL		no more available; can be replaced by the Oxford EBSD detectors NordlysMax3 or NordlysNano
EBSD acquisition and evaluation software Channel 5	HKL		no more available; can be replaced by the Oxford EBSD Software AZtechHKL
ccEBSD program ccEBSD_v1.07.exe	in house written program		for use please contact authors
EBSD interface with remote control system	Carl Zeiss AG <a href="http://www.zeiss.de/microscopy/">http://www.zeiss.de/microscopy/</a>		necessary for the electron beam control and parameter transfer between EBSD system and SEM
Vibromet2	Buehler, <a href="http://www.buehler.com/">http://www.buehler.com/</a>	671635160	vibratory polisher