

DELIXIRS

The DELIXIRS instrument will enable the multimodal investigation of dynamics of heterogeneous processes at liquid interfaces (liquid-solid, liquid-liquid, liquid-gas) with micro-molar chemical sensitivity under realistic operating conditions. Scientific use cases include environmental chemistry (CO₂ sequestration, aerosol & polar chemistry), green chemistry (liquid-liquid extraction, phase transfer catalysis), (photo-, electro-) catalysis and fundamental chemistry (solvation, nucleation). The higher brilliance of BESSY III will enable a hundredfold increase in data collection rates for ambient pressure XPS (APXPS) compared to BESSY II; XPCS is enabled by the high coherence (high-coherence branch). The wide energy range with full polarisation control will be unique and enable depth profiling at interfaces with ångström resolution. The instrument will leverage strong local expertise for experiments on liquid interfaces, including the respective sample environment.

Instrument	DELIXIRS (<i>Dynamics of Environmental Liquid Interfaces by X-ray and InfraRed Spectroscopy</i>)
Contact	David Starr (david.starr@helmholtz-berlin.de) Hendrik Bluhm (bluhm@fhi-berlin.mpg.de)
Source(s)	Undulator IVUE42 (150 – 6000 eV, fully variable polarisation) Dipole bending source for IR (400 - 4000 cm ⁻¹ / 0.05 - 0.5 eV) HHG source for EUV (5 - 180 eV, fully variable polarisation)
Beamline capabilities	High-flux branch: • Energy range: 5 eV – 6000 eV • Resolving power: 30 000 • Spot size: 10 × 10 µm² • Flux: 10¹² ph/s High-coherence branch: • Energy range: 150 eV – 4000 eV • Resolving power: 10 000 • Spot size: 3 × 3 µm² • Flux: 10¹¹ coherent photons Both branches have a downward pointing beam (2°). IR and EUV beams are transported to the sample position by separate beamlines.
Techniques	• APXPS • IR spectroscopy • X-ray scattering / XPCS at high-coherence branch • XAS and XEOL
Sample environment	Exchangeable sample modules: • Liquid jet / droplet train module(s) • Static solutions module • Colloid/nanoparticle in solution module • Electrochemistry module • 210 K – 350 K, 10⁻⁷ mbar to 1000 mbar