



Freiberg  
Instruments

Sensitivity. Innovation. Excellence.

# Next Generation TL/OSL Readers

**lexsygresearch**

Modularity Meets Innovation

**lexsygsmart**

Performance Meets Routine





We deliver cutting-edge luminescence measurement systems for precise dating, dosimetry, material research, radiation monitoring and more, offering unmatched sensitivity and dependable performance.

**Thanga Kumar**  
Sales Director

## Content

|                                         |      |
|-----------------------------------------|------|
| Features & Applications                 | → 03 |
| At-a-Glance Comparison                  | → 04 |
| Training Course                         | → 06 |
| Inside lexsygresearch                   | → 07 |
| Configuration Options<br>lexsygresearch | → 08 |
| Measurement Examples                    | → 10 |
| Control and Analysis Software           | → 12 |
| Service                                 | → 14 |



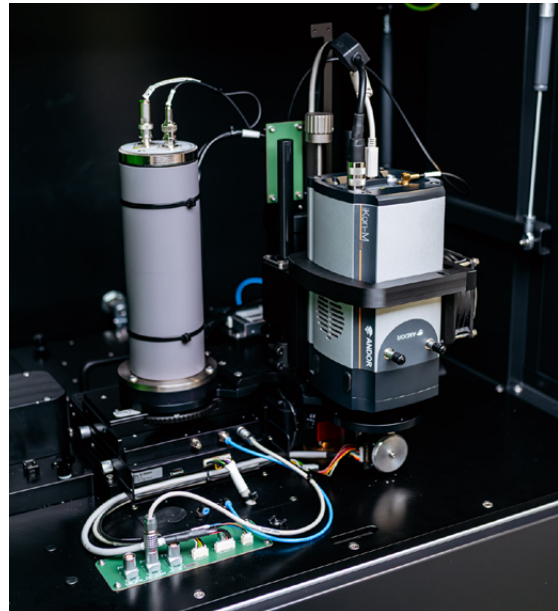
# Built for Routine, Ready for Research

lexsyg series



## Features & Performance

- ✓ **Modular instrument configuration**  
Interchangeable OSL stimulation units (up to three wavelengths), supporting multiple detection units and irradiation sources (Alpha, Beta and X-ray)
- ✓ **No stimulation or irradiation crosstalk**  
Independent operation of measurement chamber and sample changer
- ✓ **Software-controlled detection filters**  
Automatic filter exchange within programmed measurement sequences
- ✓ **Homogeneous optical stimulation**  
Light configuration ensures homogeneous illumination for all measurements
- ✓ **Feedback-stabilized OSL stimulation**  
Individual control loops for each LED or laser diode allow high reproducibility



### Applications

Luminescence dating | Material research  
Authenticity testing | Accident dosimetry  
Radiation protection | Food irradiation  
Solid state dosimetry | Bioluminescence  
and more



# Capabilities That Enable Research



|                             |                                                                                                                   |                                                                                 |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| System Design               | Fully modular and expandable research platform for advanced luminescence studies                                  | Compact, space-efficient system optimized for routine and standard measurements |
| Sample Handling             | Integrated 80-position carousel allowing true 24/7 operation                                                      | Two removable 40-position carousels allowing true 24/7 operation                |
| Detection Configuration     | Automatic detection changer supporting up to 4 built-in detection units (PMT, (EM)CCD, Spectrometer)              | Fixed single detector position with a PMT                                       |
| Thermal Stimulation         | From room temperature up to 710 °C, programmable heating and cooling, rates 0.1 – 20 °C/s                         | Same as lexsyresearch                                                           |
| Peltier Cooling             | –50 °C to +100 °C, stable low-temperature operation (–40 °C for > 60 min)                                         | –                                                                               |
| Optical Stimulation Sources | High-power LEDs / laser diodes 980 nm (IR), 850 nm (IR), 830 nm (IR), 458 nm (Blue), 525 nm (Green), 620 nm (Red) | Same as lexsyresearch                                                           |
| OSL Measurement Modes       | CW-OSL, LM-OSL, POSL                                                                                              | Same as lexsyresearch                                                           |
| Pulsed OSL                  | 10 µs standard, optional Time-Resolved ultra-fast < 10 ns pulsing                                                 | 10 µs standard                                                                  |

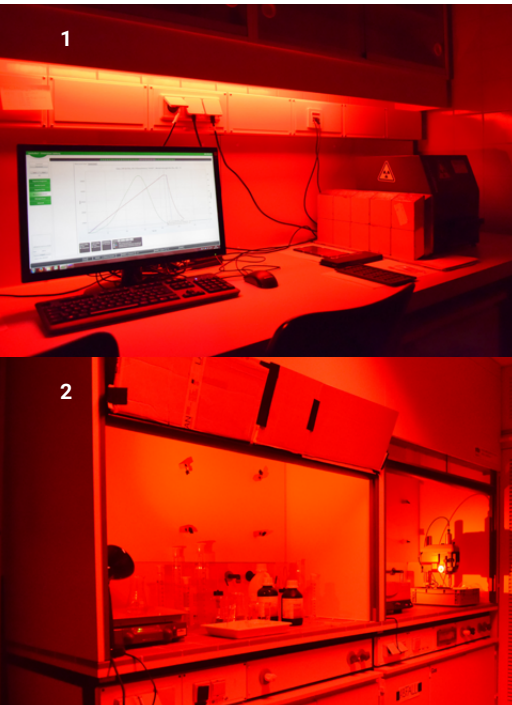


# At-a-Glance Comparison

|                                     | lexsygresearch                                                                               | lexsygsmart                                                  |
|-------------------------------------|----------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| <b>Irradiation Sources</b>          | Up to three sources (e.g., Beta, Alpha, X-ray)                                               | Single source (Beta or X-ray)                                |
| <b>Photomultiplier Tubes (PMTs)</b> | Wide spectral coverage 160 – 1200 nm (UV–NIR) with specialized PMT options                   | Same as lexsygresearch                                       |
| <b>Detection Filter Wheels</b>      | Up to 2 exchangeable 6-position filter wheels (8 mm max. filter thickness)                   | Single 6-position filter wheel (8 mm max. filter thickness)  |
| <b>IRPL Detection</b>               | 880 nm and 955 nm emissions                                                                  | Same as lexsygresearch                                       |
| <b>Bleaching Options</b>            | Solar simulator or monochromatic UV LED (365 nm)                                             | OSL unit with built-in UV-LED (365 nm) or IR LED (850 nm)    |
| <b>Single-Grain Analysis</b>        | Option 1: Dual Laser Single Grain OSL unit<br><br>Option 2: (EM)CCD-based spatially resolved | —                                                            |
| <b>Emission Spectroscopy</b>        | CCD-based UV–IR high-sensitivity spectrometer                                                | —                                                            |
| <b>Radioluminescence (RL)</b>       | Beta or X-ray irradiation; detection with PMT (180 – 890 nm) or spectrometer                 | Beta or X-ray irradiation; detection with PMT (180 – 890 nm) |
| <b>X-ray Fluorescence (XRF)</b>     | Estimation of feldspar composition (K/Na/Ca) and detection of quartz contamination           | —                                                            |
| <b>Sample Checking</b>              | Integrated sample camera for grain count, size, coverage, and color distribution analysis    | —                                                            |
| <b>Power Requirements</b>           | 110 – 250 V AC, 10 A                                                                         | Same as lexsygresearch                                       |
| <b>Dimensions &amp; Weight</b>      | 716 × 1033 × 850 mm, ≥ 100 kg                                                                | 300 × 420 × 350 mm, ≥ 50 kg                                  |
| <b>Control Computer</b>             | Windows® 11 or newer with two Ethernet ports (for system operation & remote support)         | Same as lexsygresearch                                       |



# Luminescence Dating Course



In partnership with the Helmholtz Institute Freiberg for Resource Technology (Germany), we offer a specialized training course in luminescence dating for researchers, laboratory technicians, and graduate students in geochronology, geology, archaeology, and environmental sciences.

✓ **Fundamental Principles  
of Luminescence Dating**

Understand the principles of thermoluminescence (TL) and optically stimulated luminescence (OSL)

✓ **Measurement Techniques  
and Data Analysis**

Equivalent dose determination, SAR protocols, and interpretation of luminescence data.

✓ **Instrumentation and  
Measurement Programming**

Operation of lexsys readers, sequence programming, and signal detection systems.

✓ **Sample Preparation and  
Laboratory Practice**

Quartz and feldspar preparation, mineral separation, and reliable lab procedures.

1 Luminescence lab setup

2 Sample preparation lab setup



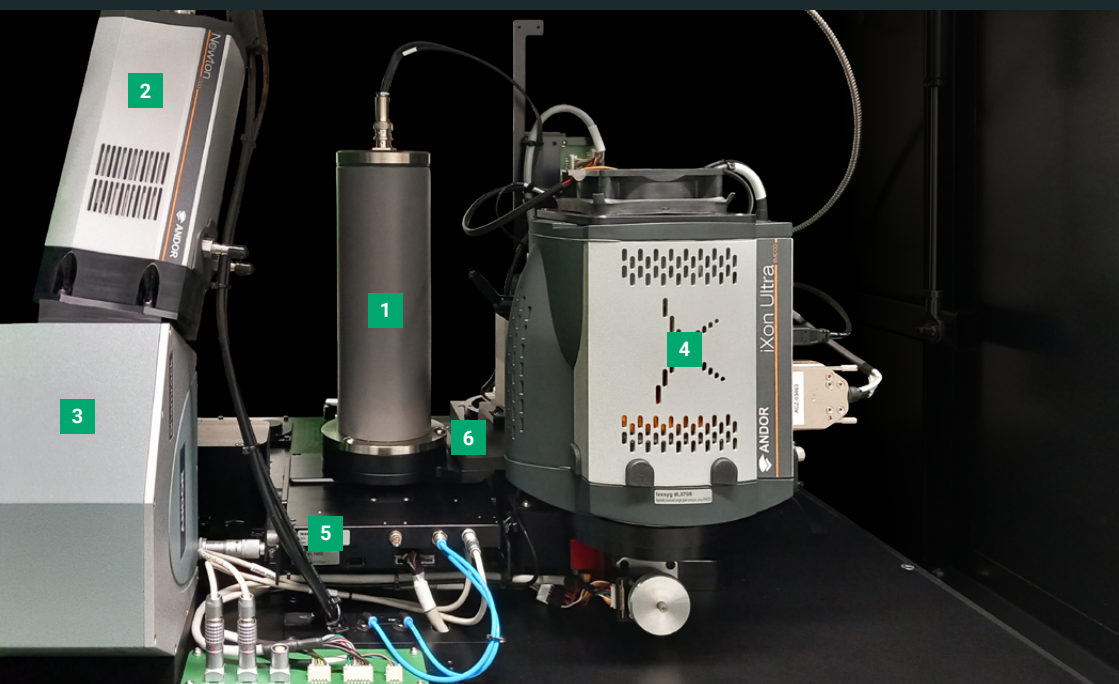
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# Modular by Design

The system combines a robust core setup – sample carousel, detector changer, OSL unit, irradiation source, PMT and filter wheel – with a modular design that enables flexible customization using components like special PMTs, filters, (EM)CCDs, Spectrograph and more.

- 1 High-sensitivity luminescence detection with PMT
- 2 Luminescence spectra analysis using CCD
- 3 Spectrograph for precise spectral measurements
- 4 (EM)CCD for spatially resolved luminescence imaging
- 5 Automated filter wheel offering 6 selectable detection windows
- 6 Versatile detector changer supporting up to four different detectors





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# Expand Research Possibilities

## Single Grain Analysis



For mixed sediments or heterogenous radiation fields

- Dual laser: Green (520 nm) and IR (830 nm)
- Single grain discs ( $\phi = 300 \mu\text{m}$ ) and calibration disc are included

## CCD based Spectrometry



Motorized adaptive focusing to achieve the best spectral resolution

- UV/IR spectroscopy
- IR-RF spectrometry

## Infrared Photo Luminescence (IRPL)



High-precision detection for IRPL feldspar analysis

- VIS-NIR PMT detector (380 – 890 nm) optimized for 880 nm IRPL
- NIR PMT detector (950 – 1200 nm) optimized for 955 nm IRPL



Enhance your tools with specialized modules for luminescence dating, dosimetry and material research. From single grain analysis to IRPL, imaging and spectrometry, each option adds targeted functionality to your workflow. Seamless integration ensures consistent performance as you expand.

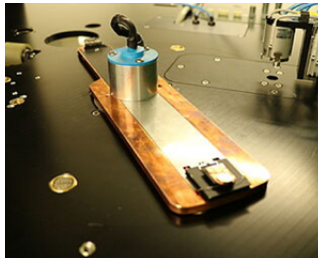
### Imaging using EMCCD/CCD



State-of-the-art EMCCD and CCD cameras

- EMCCD: Back-illuminated, 512 × 512 pixel, UV - NIR
- CCD: Ultra sensitive, 1024 × 1024 pixel, UV - NIR

### Peltier cooling



For radiation defect characterization

- -50 °C to +100 °C
- > 60 minutes stability at -40 °C
- For irradiation, OSL, TL, RF(RL) and bleaching

### Bleaching facility



Simulation of solar spectrum or (monochromatic) bleaching conditions

- Option 1: Solar simulator
- Option 2: UV LED stimulation 365 ± 3 nm

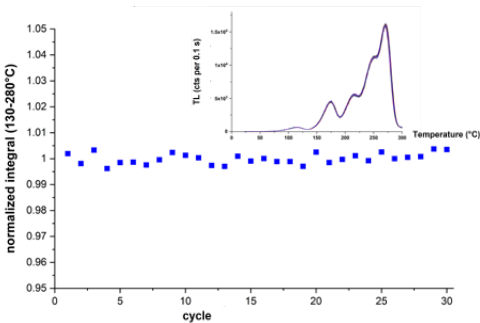


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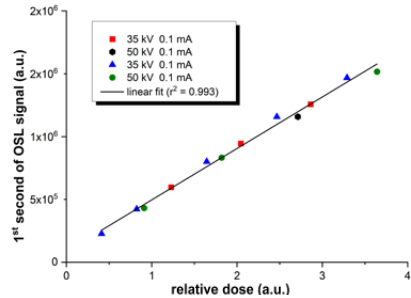
# Performance in Practice

## Reproducibility



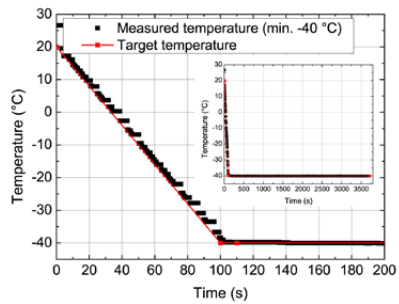
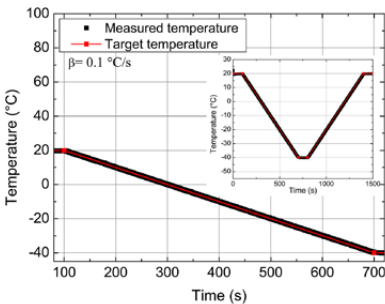
Thermoluminescence response of 30 identical doses to a single MTS-N (LiF:Mg,Ti), demonstrating exceptional reproducibility (sd = 0.2 %). Inset displays the 30 TL curves (from Richter et al., 2025).

## Reliability



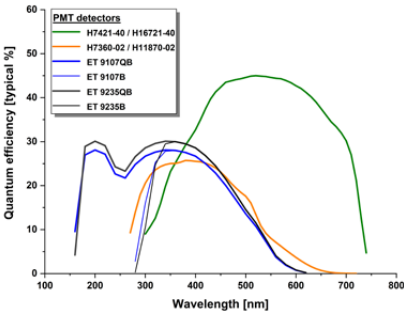
Linearity of blue OSL dose response of a single  $\alpha$ -Al<sub>2</sub>O<sub>3</sub>:C irradiated at various voltages and times demonstrates the reliability and reproducibility of the uniquely flux-monitored X-ray irradiator (from Richter et al., 2016).

## Stability of Peltier cooling



Peltier cooling with lexsygresearch shows minimal deviation between measured and target temperatures, especially at slow rates (left), while consistently maintaining -40 °C for over 1 hour (right) (from Discher et al., 2019).

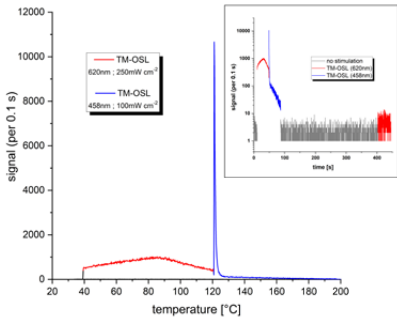
# PMT selection guide



Typical PMT quantum efficiencies (%). H\* = Hamamatsu, ET\* = Electron Tubes (after Richter et al., 2025).

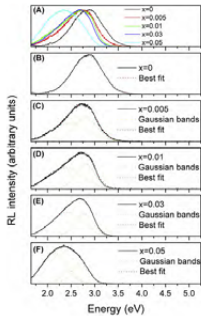
# Measurement Examples

## Luminescence dating



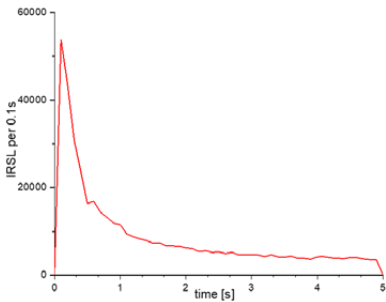
TM-OSL of quartz with varying stimulation wavelengths in a single measurement: 620 nm (40 to 120 °C, red), 458 nm (120 to 200 °C, blue), followed by cooling (grey) and 620 nm stimulation (40 – 120 °C, red) (from Richter et al., 2025).

## Material research



Radioluminescence investigation of Ce incorporation in LiLaZr (from Trofimov et al., 2017).

## Single feldspar grain



Infrared stimulated signal from a single feldspar grain and its corresponding dose response curve.



# Software Designed for Your Workflow

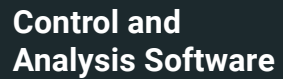
## LexStudio

for **lexsygsmart** **lexsygresearch**

### Operating Software

- Automated SAR / pIRIR / PET-IRSL-SAR sequence generation
- Flexible parameter definition (stimulation, detection, heating)
- Continuous monitoring of heater temperature and LED/laser power
- Data export: Excel/CSV, ASCII, BIN, BINX, XSYG
- Multi-level user management with configurable access rights
- Transfer (stimulation, detection, heating) to its own point: multiple changes of stimulation, detection or temperature within a single measurement

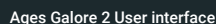


for **lexsygsmart** **lexsygresearch**

- Based on R-package Luminescence
- SAR / pIRIR / PET-IRSL-SAR / Single-Grain analysis
- Multiple aliquot regression analysis
- Reporting function (Print/PDFs)
- Automated background subtraction (optional)
- Data import (bin-, binx-, XSYG-formats)

for **lexsygresearch**

- Optimized for CCD/EMCCD imaging datasets from lexsysresearch
- Automatic cup-image association during measurement
- True pixel-wise luminescence analysis with spatial resolution
- Individual curve fitting per pixel or user-defined ROIs
- Interactive ROI selection to exclude contaminants and artefacts
- Supports detailed evaluation of signal heterogeneity





# Here When You Need Us



✓ **Remote Assistance**

Quick troubleshooting and guidance via phone, email or remote access.

✓ **Fast Repairs & Maintenance**

Swift service to restore your device's functionality as soon as possible.

✓ **Local-Language Support**

Assistance in multiple languages to ensure clear and efficient communication.

✓ **Upgrades**

Keep your instrument up to date with our modular system.



# A New Approach to Non-Destructive Luminescence Core Profiling

## Features

Non-destructive sediment core  
luminescence scanning

Automated high-resolution core profiling

Dual IR & blue LED stimulation

High-sensitivity PMT detection

Optimized for rapid  
stratigraphic screening

Flexible CW and pulsed OSL modes



Learn more



TL/OSL series

**PSLcore**



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# Contact Us to Get Started

See lexsyg in Action

Contact: [sales@freiberginstruments.com](mailto:sales@freiberginstruments.com)



Get in touch