Micro Fading Tester

to examine color fading rate under irradiation

Micro Fading Tester is designed to determine preservative lighting policy for cultural heritage.

Description

The Micro Fading Tester (MFT) allows to examine the behaviour of dyes under irradiation in a non-destructive way. The illuminated spot has 0.5 mm or less in the diameter. During the examination, the color change of the illuminated spot is evaluated. The color change assessment is based on the reflected light spectrum analysis. The Micro Fading technique allows to rank objects in collections by their sensitivity to light. This approach allows to adapt the lighting policy for a given set of exhibitioned objects rather than use general assumptions which could be either too conservative and unnecessarily limit viewers access to the object or too optimistic and lead to irreversible light-induced damages.

The Micro Fading examinations can be performed for nearly all classes of materials found in museum collections and is particularly suited to study fugitive objects (works on paper: manuscripts, prints, watercolors, canvas paintings, textiles).

The Micro Fading Tester is a portable instrument. It can be transported to the objects' location, which is particularly important in case of objects like wall paintings, sculptures or exhibit of significant cultural value so that the unnecessary transportation damage risk is avoided.

Regular Micro Fading Tester is equipped with 1 LED 2700 K source. The LED serves as both: aging and probing light. The Scientific grade MFT is equipped with a LED Changer with 6 LED slots to perform more comprehensive investigations of the fading effect caused by different light spectrum.

Instrument measures the light reflected by the illuminated spot of the sample.

INSTYTUT FOTONOWY

Quantities evaluated by the software:

- Total color change (ΔE76, ΔE94, ΔE2000) of the selected point in function of time and radiometric/photometric dose,
- Coordinates in the CIELAB colour space for each spectrum collected,

Specifications

Instrument components

- Total mass: 5 kg,
- Size: 250 x 400 x 440 mm,
- Tripod mounting brackets,
- Vertical motion range of the optical head: -80 ÷ 200 mm, manually and via software controlled,
- Automated LED slot selection in the LED Changer, controlled via software,
- Automated shutter, controlled via software,
- Limit switch to prevent the sample from an accidental run by the optical head,
- Digital camera, controlled via software,
- White reference: Fotolon,
- PC connectivity: USB 2.0,

Light source

- 2700 K LED,
- Additional 5 custom selected LEDs (Scientific grade MFT),
- Spot diameter: 0.5 mm,
- Maximum light intensity at focus: 4 mW (depends on the LED),
- Incident light intensity controlled via software,
- Automated spot focusing,

CCD Spectrometer

- Spectrum range: 340 ÷ 750 nm,
- Wavelength resolution: 1.5 nm,
- SMA socket for the optical fiber at the slit entrance,
- Optical fiber length: 80 cm,
- Integration time: 10 µs ÷ 1 s, adjusted via software,
- Internal averaging,

Key software features

- Automated experiment control,
- Automatic measurements termination when a given criteria is met (time, dose, color change),
- Automated procedure of LEDs calibration with the Light Calibrator,
- Results averaging,
- One-click full report generation.

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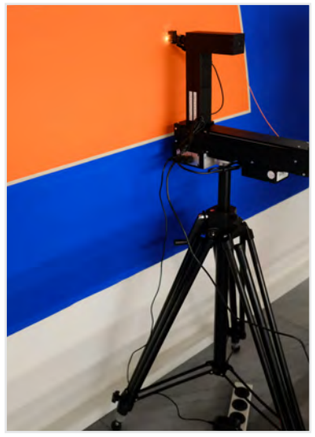
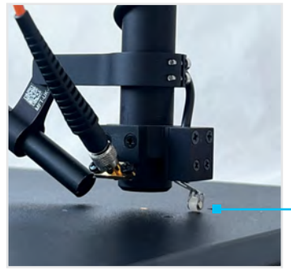
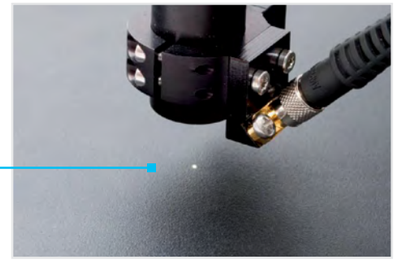


MFT on a tripod.



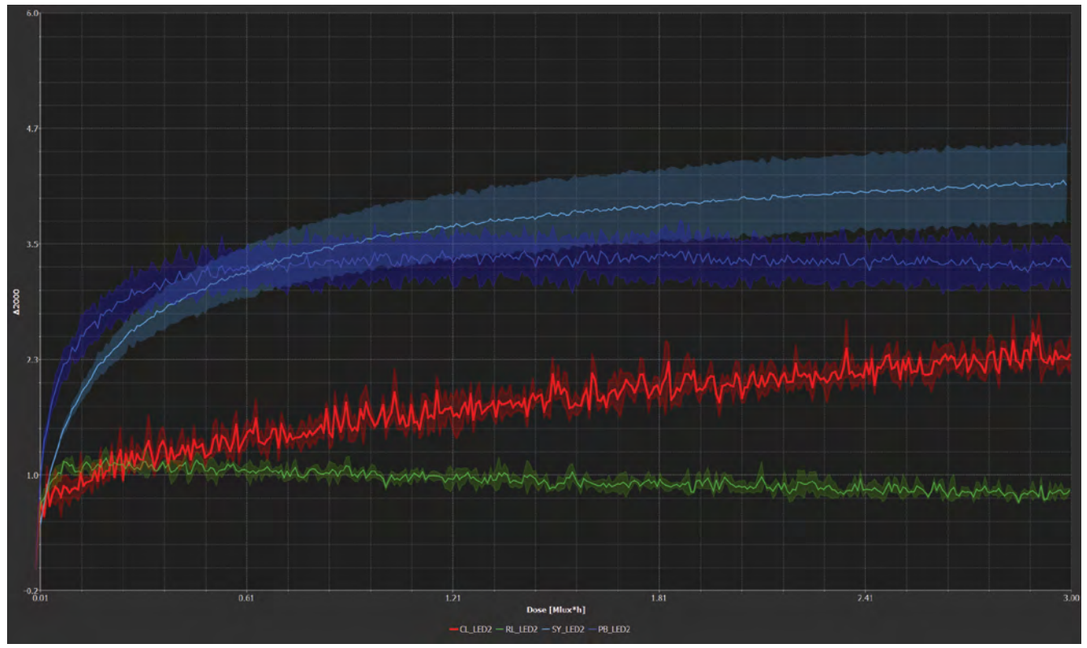


LED selection list for the Scientific grade MFT:

White LEDs		Monochromatic LEDs			
1. 3000 K	4. 5000 K	1. 365 nm	4. 425 nm	7. 595 nm	10. 855 nm
2. 3500 K	5. 5700 K	2. 390 nm	5. 455 nm	8. 635 nm	
3. 4000 K		3. 405 nm	6. 525 nm	9. 735 nm	

MFT modules

Exemplary results



Aging results for oil paints with: Prussian Blue (PB), Strontium Yellow (SY), Carmine-based Lake (CL), Red Lead (RL) pigments. Results were performed and shared by dr Tomasz Łojewski (AGH University of Science and Technology).