

Irradiation setup

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Tags: Radiation

Category: Protocol

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Goal

Irradiation of a sample

Prerequisites and preparation

- Radiometer (843-R-USB, Newport, [843-R-USB Optical Power Meter \(newport.com\)](https://www.newport.com/p/843-R-USB)), Thermopile Sensor 919P-020-12 from NewPort <https://www.newport.com/p/919P-020-12>

Light Source

- Mightex super high-power LED collimator sources, 22 mm aperture, see [Super High-Power LED Collimator Sources, 22-mm Clear Aperture : Mightex \(mightexsystems.com\)](https://mightexsystems.com/super-high-power-led-collimator-sources)

- Power source: Mightex BLS-Series High-Current LED Drivers, see [BLS-Series High-Current LED Drivers with Manual & Analog-Input Controls and Tool-free Connectors - Mightex : Mightex \(mightexsystems.com\)](https://mightexsystems.com/bls-series-high-current-led-drivers)

- Mightex LCS-BC25-0409 multi-wavelength beam combiner, 340 - 400 nm reflection, 415 - 900 nm transmission, see [Multi-Wavelength Beam Combiners for LED Collimator Sources - Mightex : Mightex \(mightexsystems.com\)](https://mightexsystems.com/multi-wavelength-beam-combiners)

Steps

Step number	Step description
1. Preparation of the Irradiation set-up	<p>The dark box is equipped with:</p> <ul style="list-style-type: none">• one Labjack carrying the Mightex LED light sources (365 and 470 nm or 405 nm or white LEDs, high-power with beam combiner, no light guide)• one Labjack carrying a stirring plate• one holder for a clamp• thermostat <p>Important note: The switch on the LED itself should be not used (should always be in the "on" ("I") position.</p>

2. Adjusting the intensity	<p>To determine the intensity of the Mightex LED light sources a Thermopile Sensor (from Newport, 919P-020-12, detector active area = 1.13 cm^2) and a Optical Power meter is used. The Thermopile sensor is placed in a clamp exactly in front of the beam combiner. The sensor is connected with the optical power meter which is placed outside of the dark box. The distance from the edge of the beam combiner to the edge of the sensor is determined.</p> <p>It has to be ensured that the power sources for the LEDs are off and the buttons are set to 0 (off). Then, the LED switch is turned on.</p> <p>Before the LED lamps can be turned on safety precautions have to be taken!</p> <ol style="list-style-type: none"> 1. Close the dark box from all 4 sides 2. Protective clothing: lab coat, blue nitril gloves, UV-glasses <p>Procedure for two LEDs used (otherwise ignore second power source): One power source is turned on. Without looking inside the Box, a photo should be taken to ensure that the sensor is exactly in front of the beam combiner which means in the middle of the shadow from the LED light. Using the regulator button, the desired intensity of the lamp can be adjusted. The radiometer gives the intensity in Watt. After adjusting the first LED intensity, the power source is turned off and the same procedure is done for the second power source. In the end both power sources are turned on to check the sum of their intensity.</p> <p>Finally, both power sources were turned off and the optical power meter as well as the sensor can be moved away</p>
3. Build up of the irradiation setup with your sample	The sample is placed inside the dark box exactly in front of the beam combiner/LED in the same distance as the thermopile sensor.
4. Starting the irradiation	After equilibration, the (both) power source is turned on. With a photo it should be checked if the sample is placed exactly in the middle of the light beam.
5. Stopping the irradiation	The recording is stopped and the power sources are turned off.

How to calculate the required intensity?

Example: We want to have an Intensity of 200 W m^{-2} . We know the area of the sensor, so we can calculate how much power is needed from the LED

Calculation: $200 \text{ W m}^{-2} * (1.13 * 10^{-4} \text{ m}^2) = 22.6 \text{ mW}$

Sanity check:

sun light: $1000 \text{ W m}^{-2} = 100 \text{ mW cm}^{-2}$

Comment

On Jacob Schneidewind wrote:

Notes:

* referencing this protocol in other protocols that use the irradiation set-up



Unique eLabID: 20221031-c3e96398d66cc5dfa1e7369e0e0b5a00b33a58fc

Link: <https://elab.water-splitting.org/database.php?mode=view&id=36>