Precise spatial bioink curing through digital light projection

Cellbricks GmbH

At Cellbricks Therapeutics, we are committed to make a significant impact on the lives of millions of patients dealing with compromised organ function. We achieve this through the innovative production of bioprinted tissue therapeutics, offering humans longer and healthier lives by restoring or supporting organ function. Cellbricks Therapeutics is a biotech company, combining world-leading expertise in synthetic biology and 3D-bioprinting. Leveraging our proprietary biofabrication technology and our tissue engineering proficiency, we are replicating human tissue at scale so researchers and doctors can provide patients with better clinical treatments. Our rapidly growing, multi-disciplinary team consists of biotech enthusiasts, scientists, PhDs, engineers, chemists and entrepreneurs from excellent universities and top companies from all over the world. Our labs and offices are located in Berlin, Europe's start-up capital.

Measurement Setup

The 3D-Bioprinter uses digital light projection to generate images for each layer of a 3D bioprint. A UVA-LED is used as a high intensity light source in our light engine with a specific narrow wavelength of 385 nm. The light engine can project highly accurate images with minimal distortion on a large projection plane. A homogenous light intensity and distribution is directly affecting the quality of our bioprinted tissues. Therefore, we apply the Gigahertz-Optik BTS256 spectroradiometer to determine the light intensity and wavelength distribution at the corners and the center of the projection area (Figure 1).

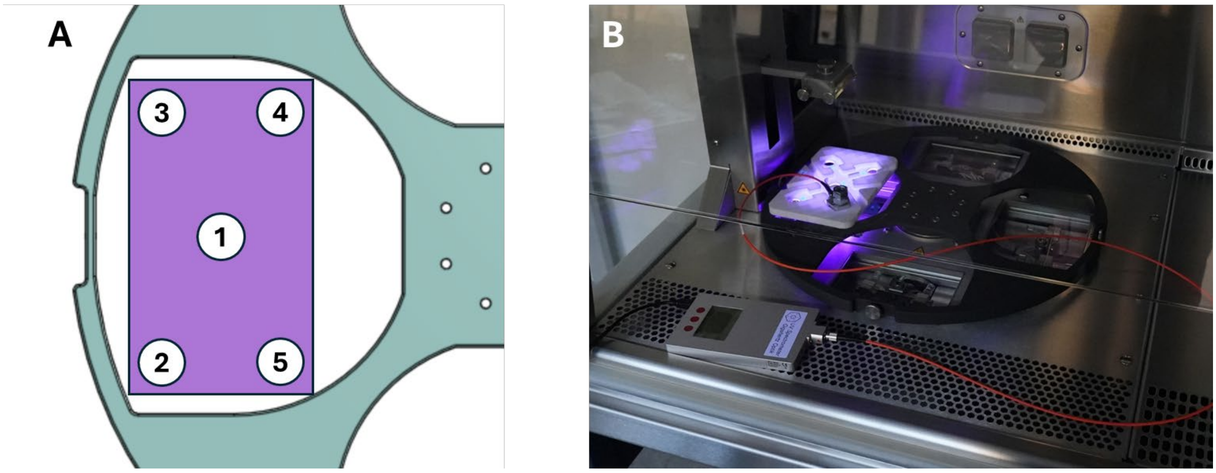

Figure 1 UV spectrometry. A) Measurement points 1-5, center and corners, for light intensity and spectral measurement at rotary table slot 1. B) Experimental setup on rotary table of bioprinter.

Results

In our measurements we determine the deviation of light intensity between our measurement points as well as the deviation of the peak wavelength from 385 nm in a defined projection area. Results show a stable light distribution and a peak wavelength of 385 nm <± 1 % depending on the applied LED power. Increasing the LED power shifts the peak wavelength towards 390 nm. The deviation in light intensity is orchestrated by the lens setup used in the light engine. Here the light deviation is ranging from <1 % to < 10 % as subject to the projection size and distance according to the optical setup.

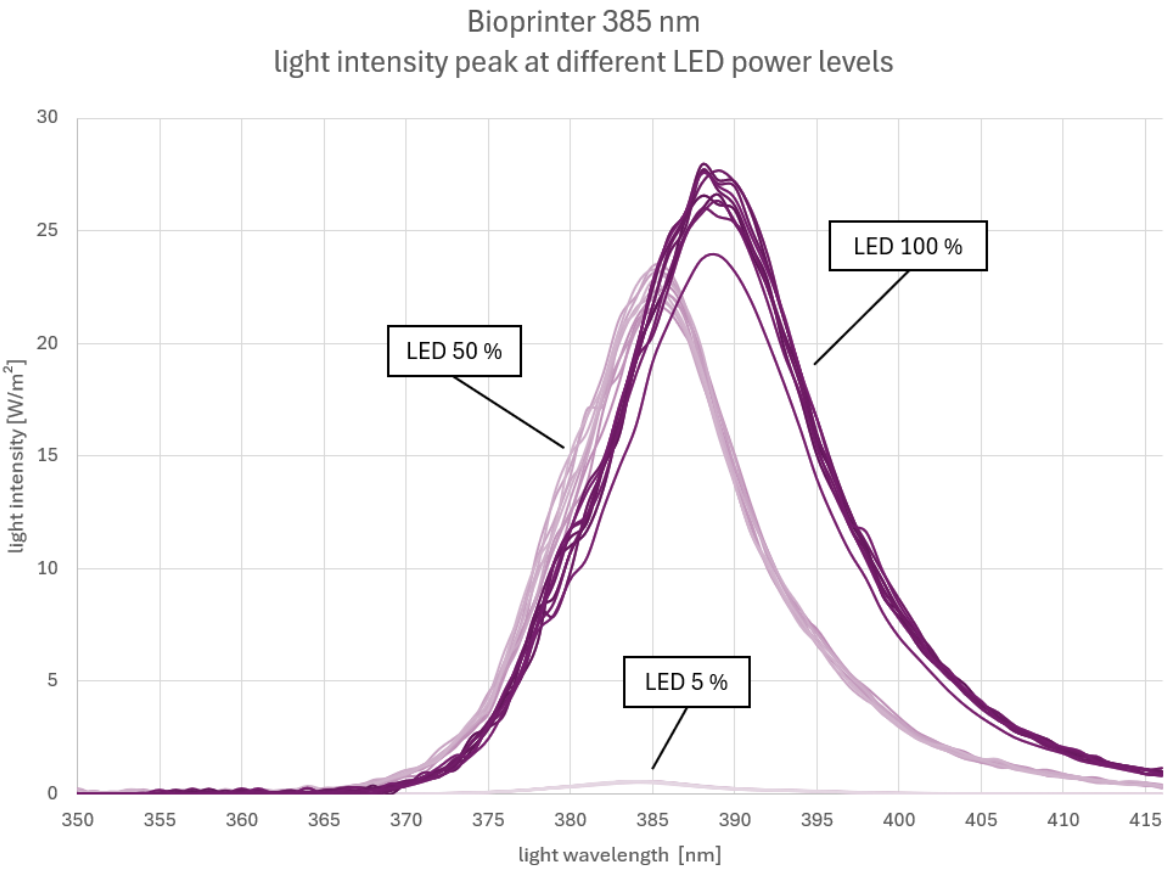

Figure 2 Spectral analysis of 385 nm UVA LED at 5 %, 50 % and 100 % power measured at the center and corners of the digital light projection area.

Conclusion

The highly accurate BTS256 spectroradiometer from Gigahertz-Optik enables us to reliably quantify the light output and distribution over the projection area of our bioprinters. The small formfactor and its flexible lightguide make the BTS256 a perfect tool for measuring the light irradiance and wavelength distribution not only in a lab setup but also on sight in the bioprinters for regular quality control and maintenance.

Dr. Tobias Lam, CTO
Cellbricks GmbH
Müllerstraße 178
13353 Berlin