

Electronic Supplementary Information

Plant habitat-conscious white light-emitting devices: Dy³⁺-emission considerably reduces involvement in photosynthesis

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As a comparison of emission intensity, we carried out measurements of luminance for the KYWP:Dy and the other reported Dy-phosphors (Fig. S1), Ca₉La(PO₄)₃:Dy,¹ Ca₉Y(PO₄)₃:Dy,² Ca₃Si₂O₇:Dy,³ LaAlGe₂O₇:Dy,⁴ LiGdP₄O₁₂:Dy and LiYP₄O₁₂:Dy (LiGdP₄O₁₂:Dy and LiYP₄O₁₂:Dy were prepared as a related material with LiLaP₄O₁₂:Dy⁵, since we have not obtained sufficient quality product of this material.). All phosphors were prepared by a solid state reaction for this measurement.

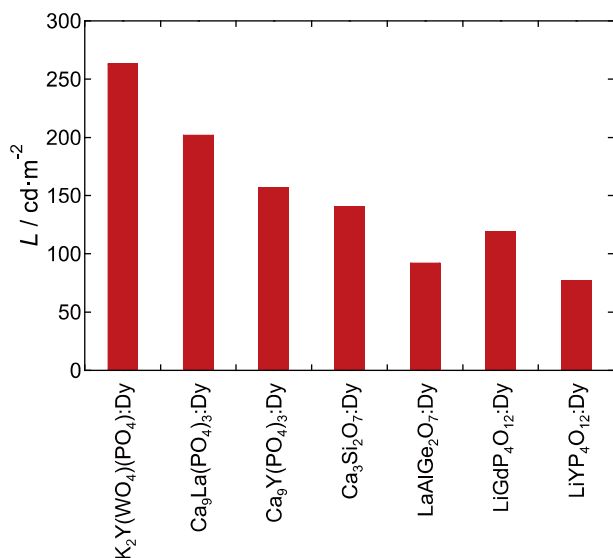


Figure S1: The luminance of Dy-phosphors observed under the UV excitation of 350 nm at 5 mW·cm⁻².

We have checked the UV illumination effect to the *Chlorella* whether the near UV wavelength used in the Dy-WLED as the excitation at 385 nm damages the cells or not. Three different illumination conditions were

used: (1) WLED1 at 5k lm·m⁻², (2) Dy-WLED at 5k lm·m⁻² and (3) UV-LED (365 nm) at 3 mW·cm⁻² in addition to the Dy-WLED at 5k lm·m⁻². The excess UV light from the Dy-WLED was *ca.* 15 μW·cm⁻² in this measurement. The *Chlorella* dispersions were illuminated by these light sources for 165 hours. The optical microscope images are shown in Fig. S2. The *Chlorella* cells had green color derived from the chlorophylls, and the cell shape and color were not changed by the light sources during the illumination.

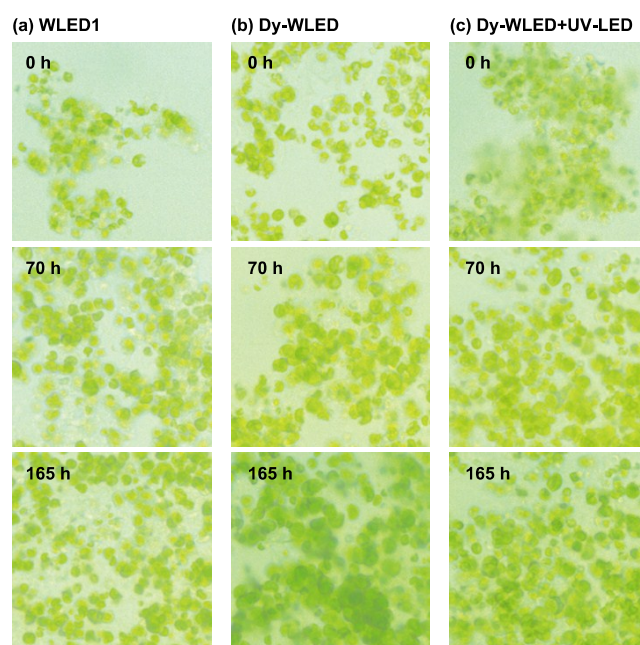


Figure S2: Optical microscope images for the *Chlorella* cultivated under three types of LEDs: (1) WLED1 at 5k lm·m⁻², (2) Dy-WLED at 5k lm·m⁻² and (3) UV-LED (365 nm) at 3 mW·cm⁻² in addition to the Dy-WLED at 5k lm·m⁻².

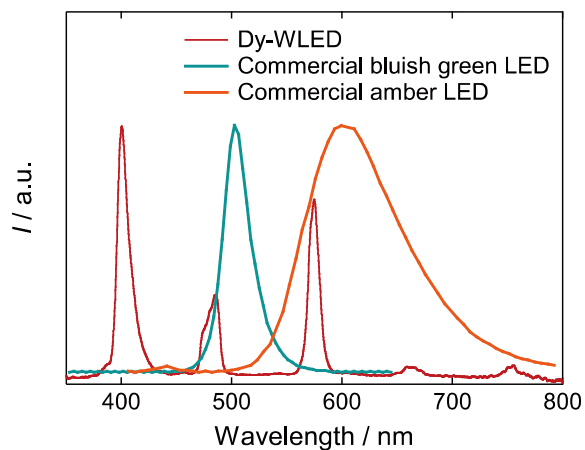


Figure S3: The emission spectra of LEDs.

Figure S3 shows the emission spectra of the Dy-WLED (this work) and commercial bluish green and amber LEDs (NCSE119AT⁶ and NJSA172⁶, Nichia).

References

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