Angle-Resolved Spectroscopy of *Morpho* butterfly Wings

Leon Oleschko
31.03.2025

Nanofabrication and coloration study of artificial Morpho butterfly wings with aligned lamellae layers

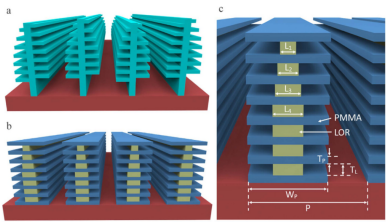

Figure 1. Schematic diagram for the *Morpho* butterfly wing scales. (**a**) The Original configuration similar to real wing scales with Christmas-tree shape and off-set lamellae layers. (**b**) The designed scales to be fabricated with aligned lamellae structures of PMMA/LOR alternate layers. (**c**) Definitions of dimension symbols used in the text.

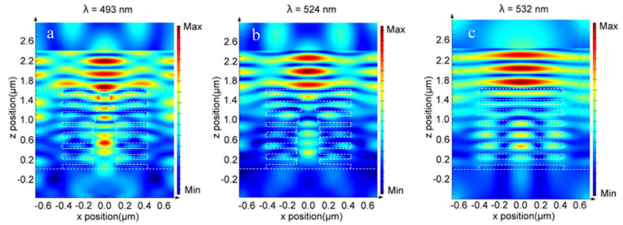

Figure 3. The FDTD simulations of spatial distributions of the electric field, E2 for the three wavelengths in Figure 3b. (**a**,**b**) correspond to the wavelengths at 493 and 524 nm, respectively, in Green_3. The strongest travelling mode seen in the PMMA/LOR pillar in (**a**) is responsible for the reflection dip at 493 nm in the spectra (both the red and the blue line) in figure 3b. The relatively weak E^2 in the multilayer in (**b**) (524 nm) and (**c**) (532 nm) explains the high reflection in the spectra. The dash lines highlight the lamellae structures.

"Nanofabrication and coloration study of artificial Morpho butterfly wings with aligned lamellae layers", Zhang et al. 2015

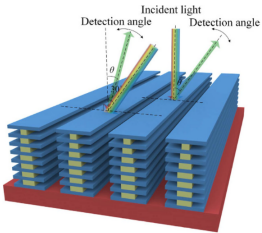

Figure 7. The schematic diagram for the light illumination with normal incidence and oblique incidence, respectively. The detection angle changes from 0° to ±40°.

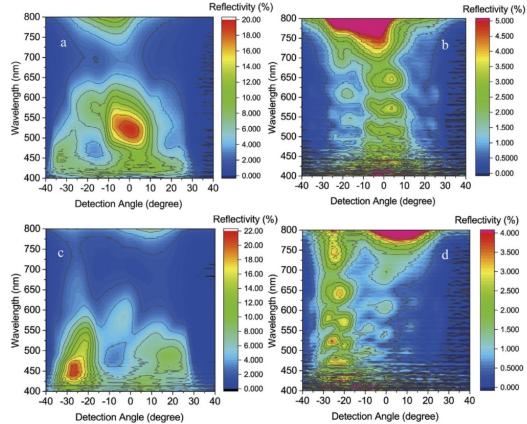

Figure 8. The measured angle-resolved reflectance spectra from the fabricated green color scales with totally 15 layers (Green_3) under normal incidence (**a**) and oblique incidence (**c**), respectively. The detection angle changes from 0° to ±40° progressively. For comparison, the same measurements were repeated on PMMA grating (**b,d**). Detailed descriptions are given in the text.

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Design Idea without Optics