

All-Optical Switching Demonstrated with Photoactive Yellow Protein Films

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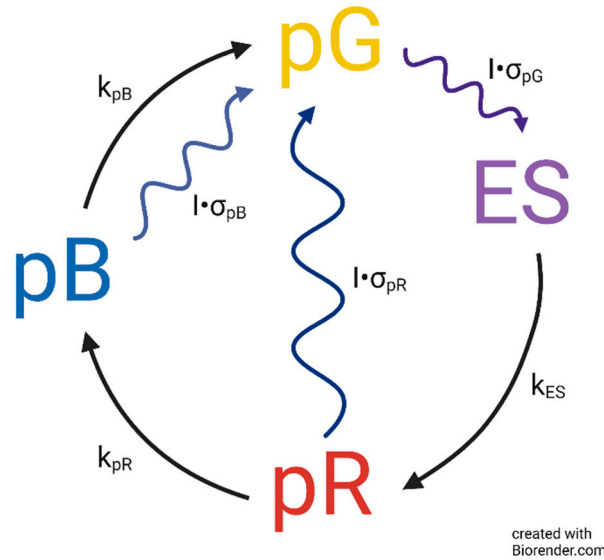


Figure S1. A simplified scheme of the PYP photocycle, including the light-induced and thermal reactions, represented by undulated and solid arrow lines with the corresponding rate constants, respectively. I and σ represent the light intensity and the absorption cross sections, pG stands for the ground-state pigment, ES is the blue-shifted first excited state forming on the 10-fs time scale at high I intensities, and decaying to the red-shifted pR on the nanosecond to microsecond time scale [Konold et al.]. pR decays further to the blue-shifted pB on the ms to 100-ms time scale [Khorosy et al., Krekic et al., 2019]. Both pR and pB can be driven back by photoexcitation to pG. .

The differential equation system describing the kinetics of the concentrations of the photocycle intermediates:

$$\frac{d[pG]}{dt} = -I \cdot \sigma_{pG} \cdot [pG] + I \cdot \sigma_{pR} \cdot [pR] + I \cdot \sigma_{pG} \cdot [pG] + (I \cdot \sigma_{pB} + k_{pB}) \cdot [pB]$$

$$\frac{d[ES]}{dt} = I \cdot \sigma_{pG} \cdot [pG] - k_{ES} \cdot [ES]$$

$$\frac{d[pR]}{dt} = k_{ES} \cdot [ES] - (I \cdot \sigma_{pR} + k_{pR}) \cdot [pR]$$

$$\frac{d[pB]}{dt} = k_{pR} \cdot [pR] - (I \cdot \sigma_{pB} + k_{pB}) \cdot [pB]$$

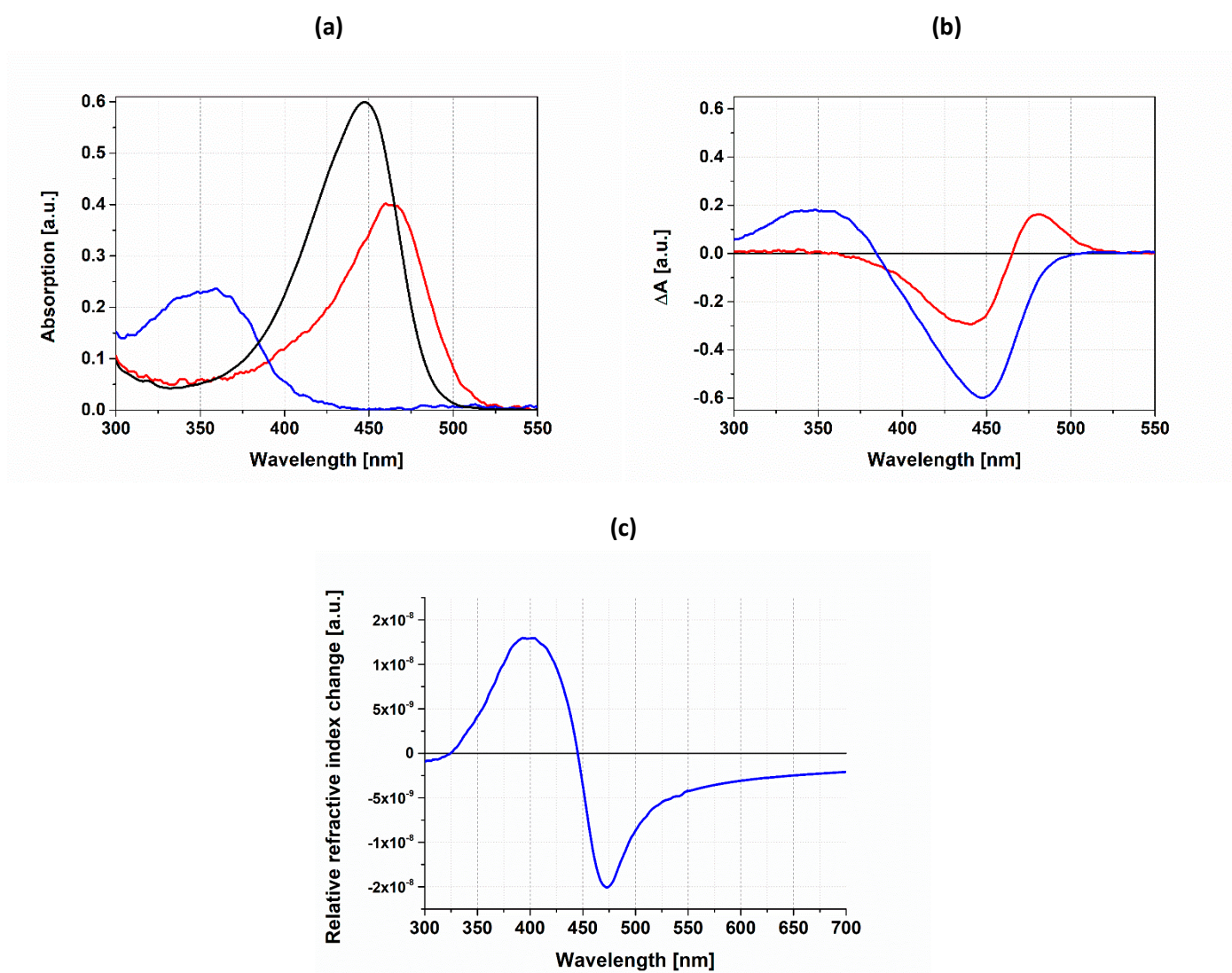


Figure S2. **a)** Absorption spectra of the ground state (pG, black), an early intermediate (pR, red) and the rate-limiting intermediate (pB, blue) of the PYP photocycle, as determined from absorption kinetic experiments [Khoroshyy et al.]. **b)** Difference-absorption spectra of pR (red) and pB (blue), as compared to the ground state (pG). **c)** Calculated change of the refractive index spectrum upon the rate-limiting pG \rightarrow pB transition (underlying the effects described in the main body of the paper), using the Kramers-Kronig relations. For more details, see [Fábián et al.].

References

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