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Tyrosine 263 in Cyanobacterial Phytochrome Cph1 Optimizes Photochemistry at the prelumi-R → lumi-R Step

Original Citation

Sineshchekov, Vitaly, Mailliet, Joel, Psakis, Georgios, Feilke, Kathleen, Kopycki, Jakub, Zeidler, Mathias, Essen, Lars-Oliver and Hughes, Jon (2014) Tyrosine 263 in Cyanobacterial Phytochrome Cph1 Optimizes Photochemistry at the prelumi-R → lumi-R Step. *Photochemistry and Photobiology*, 90 (4). pp. 786-795. ISSN 00318655

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Table 1. Spectroscopic and photochemical characteristics of the wild type Cph1 sensory module and Y263 mutants at ambient and low temperatures. Abs, Absorbance; Ex, Excitation; Em, Emission; bp, breaking point; $\Delta\lambda$, peak width (FWHH); Φ , quantum efficiency; $\chi_{\text{Pfr,max}}$, maximal mole fraction of Pfr following irradiation at Pr λ_{max} (* from (39) included to assist comparison).

	Parameter	wt	Y263F	Y263H	Y263S
Abs at T_a^*	λ_{max} (nm)	660	651	644	643
	$\Delta\lambda$ (nm)	42	50	52	50
Ex at T_a	λ_{max} (nm)	648	654	644	640
	$\Delta\lambda$ (nm)	62	52	62	60
Em at T_a^*	λ_{max} (nm)	670	678	669	663
	$\Delta\lambda$ (nm)	50	44	60	66
	$\Delta\lambda_{\text{em-abs}}$	10	27	25	20
	$\Delta\lambda_{\text{em-ex}}$	22	24	25	23
	Φ_f	0.024	0.084	0.067	0.10
Ex at T_c	λ_{max} (nm)	659	659	658	654
	$\Delta\lambda$ (nm)	34	34	38	44
Em at T_c K	λ_{max} (nm)	679	677	674	672
	$\Delta\lambda$ (nm)	28	32	46	46
	$\Delta\lambda_{\text{em-ex}}$ (nm)	20	18	16	18
	Φ_f	0.29	0.35	0.30	0.41
E_a	85 K - bp (kJ mol ⁻¹)	3.1	2.5	3.0	2.9
	bp - 273 K (kJ mol ⁻¹)	17.6	6.5	13.5	9.4
	bp (K)	219	219	225	219
Photoprocesses at T_a	k_f (10 ⁷)	5.65	7.11	4.27	7.03
	k_d (10 ⁸)	1.19	1.21	0.94	0.98
	k_p (10 ⁹)	2.18	0.65	0.5	0.53
	$\Phi_{\text{Pr} \rightarrow \text{prelumi-R}}$	0.93	0.77	0.79	0.76
	$\Phi_{\text{prelumi-R} \rightarrow \text{lumi-R}}$	0.14	0.08	0.10	0.11
	$\Phi_{\text{Pr} \rightarrow \text{Pfr}}$ from absorbance data*	0.13	0.05	0.07	0.05
	$\Phi_{\text{Pr} \rightarrow \text{Pfr}}$ from fluorescence data*	0.13	0.06	0.08	0.08
	$\chi_{\text{Pfr,max}}$ (%) from absorbance data*	70	50	46	50
	$\chi_{\text{Pfr,max}}$ (%) from fluorescence data*	70	50	40	50
	Photo processes at T_c	k_p (10 ⁷)	1.4	1.2	0.7
$\Phi_{\text{Pr} \rightarrow \text{prelumi-R}}$		0.07	0.06	0.05	0.02
$\Phi_{\text{Pr} \rightarrow \text{lumi-R}}$		0.01	0.005	0.005	0.002