

研究论文

菌紫质中视黄醛超快异构化反应的动态光谱分析

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摘要 利用飞秒时间分辨吸收光谱方法研究了菌紫质(BR)光循环中视黄醛超快异构化反应过程. 发展了结合全局拟合的奇异值分解(SVD)分析方法, 建立了超快异构化反应动力学模型, 解析了几个重要的中间态 I_{460} , J_{625} 和 K_{590} 的物种相关差异光谱(SADS)和布居动力学, 确定了光致异构化反应过程. 同时明确了700 nm附近存在的受激荧光来自于弗兰克-康登跃迁态(H 中间态)的贡献, 其衰减寿命为0.04 ps. 这些结果对深入认识 H 态在超快异构化反应过程中的作用具有参考价值.

关键词 [菌紫质](#) [超快异构化](#) [奇异值分解](#) [受激发射](#)

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Time-Resolved Spectral Analysis of Ultrafast Isomerization Dynamics of Retinal in Bacteriorhodopsin

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Abstract The ultrafast photoisomerization process of retinal in Bacteriorhodopsin's(BR) photocycle was investigated *via* femtosecond time-resolved absorption spectroscopy. Singular value decomposition(SVD) combined with model-based global fitting was employed to analyze the time-resolved spectra, and the related difference spectra(SADS) and the population dynamics of I_{460} , J_{625} and K_{590} intermediates were derived on the basis of our proposed reaction scheme. The detailed photoisomerization pathways were discussed. Moreover, the SADS of Franck-Condon state(H intermediate), radiative transition of which accounts for the stimulated emission around 700 nm, was also detected, and its time constant was 0.04 ps. Our results prove the involvement of the H -intermediate in ultrafast photoisomerization process of retinal in BR.

Key words [Bacteriorhodopsin](#) [Ultrafast isomerization](#) [Singular value decomposition](#) [Stimulated emission](#)

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