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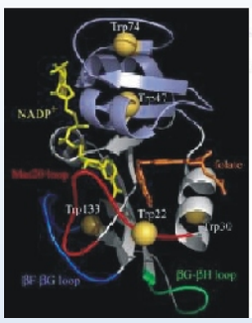
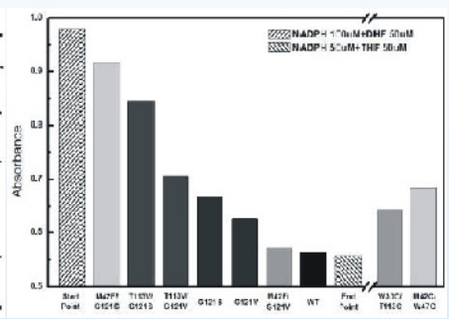
研究興趣



Dissociation Constants of mutations ecDHFR with various ligands

Dissociation Constants for mutants with various ligands

Mutation		NADPH $K_D(\mu M^{-1})$	DHF $K_D(\mu M^{-1})$
Single-mutation	G121S	13.35	14.58
	G121V	15.24	56.30
Double-mutation	M42F-G121S	99.97	69.12
	M42F-G121V	92.16	49.86
	T113V-G121S	56.68	111.2
	T113V-G121V	108.0	82.37
Build-in constriction (Disulfide bridge)	W30C-T113C	77.80	83.51
	M42C-W47C	40.84	57.39



利用時間解析光譜和單分子顯微鏡的生物物理方法研究生物大分子的結構動態學。具體來說，研究主要為三大個主題：（1）蛋白質結構動態波動對蛋白質功能和酶催化的影響；（2）生物大分子間相互作用，例如蛋白質-蛋白質/ DNA 相互作用；（3）嵌合型光控酵素設計與其光控活性探討。

• 探討蛋白質結構變動與其酵素催化功能之間的連結

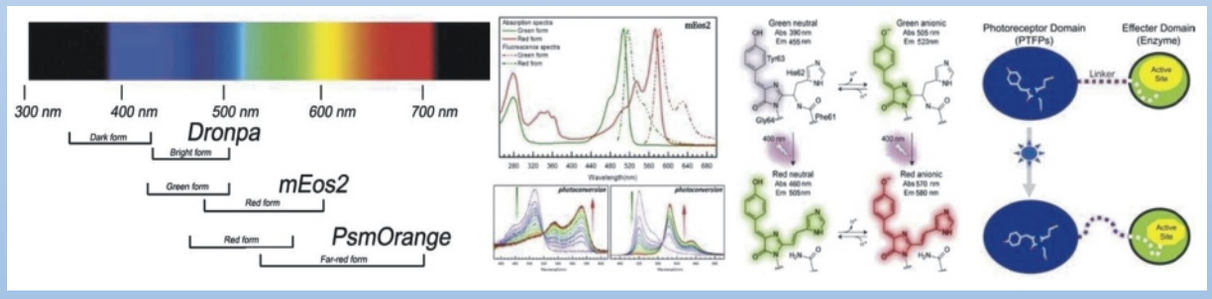
利用酵素反應中所必需的輔酶分子與酵素中的芳香族胺基酸為光學偵測分子，結合光譜學與顯影顯微技術，測量酵素輔酶分子的螢光強度於催化過程中的變化，探討巨分子動態的過程。設計一系列蛋白質變異種並逐一對其特徵進行定性與定量分析。

• 光控螢光蛋白之光化學與光物理動力學研究

利用時間解析光譜的原理，建立顯微鏡分析法，並進行光控螢光蛋白之光化學與光物理動力學研究。挑選兩大類之光控螢光蛋白[光致轉化螢光蛋白(mEos2 與 PSmOrange)與光致變色螢光蛋白(Dronpa)]做為研究體系，來探討改變外部環境和內在因素對光致形變機制的影響。

• 研究嵌合型光控酵素設計與其光控活性探討

研究此嵌合型光控酵素的光控活性效應，進而優化嵌合型光控酵素的設計。進而可以開發一個通用的方法，以＂光＂控制蛋白質活性與生物反應過程。



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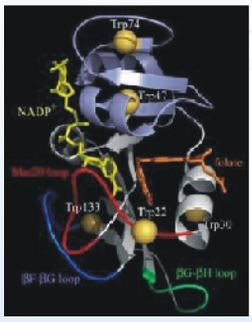
Ya-Ting Kao, Ph.D.

Research Interests



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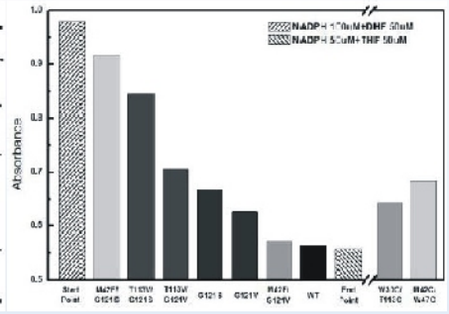

My research interests are investigating in conformational dynamics of biological macromolecules with biophysical approaches of time-resolved spectroscopy and single-molecule microscopy. Specifically, my researching interests fall under three themes: (1) unraveling the effects of protein conformational fluctuation on the protein function and enzyme catalysis, (2) understanding macromolecular assemblies, such as protein-protein/DNA interactions, and (3) designing and characterizing the light-controlled proteins.

• Protein dynamics in enzymatic catalysis:

a case study on Dihydrofolate reductase (ecDHFR)We chose a well-studied enzyme dihydrofolate reductase (DHFR) as a model and design and characterize a serious of mutations. We further investigate the relation between protein conformational fluctuations and catalytic function.

• Photophysical and photochemical dynamics of photo-transformable fluorescent proteins

Three photo-transformable fluorescent proteins (PTFPs) are with light-driven conformation fluctuation and are candidates for the photoreceptor domain, which could propagate the conformational responses to the effector domain in a light-driven fashion.

• Rational designs and activity studies on chimeric light-controlled enzymes

Controlling protein functions with light has long been an ultimate dream in biology. Our ambition aims to *rationally design and systematically characterize chimeric light-controlled enzymes in vivo.*