第 30 回機能物質化学講演会のお知らせ

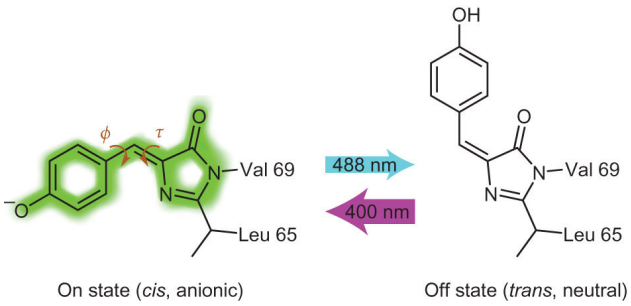
日時：2017 年 10 月 27 日（金）午後 3 時～4 時 30 分

場所： J 棟 505 室

講師：Michel Sliwa 博士　リール第 1 大学（フランス）

演題：Photo-dynamics of photo-switchable fluorescent proteins

概要：青山学院大学機能物質化学講演会では、機能性分子科学の研究でご活躍されている世界的に著名な先生方をお招きして最先端の研究をご紹介して頂いております。今回は、権威ある CNRS bronze medal の受賞者であり、光化学分野でご活躍されている CNRS Researcher の Michel Sliwa 博士をお招きし、最新の研究成果についてご講演して頂きます。



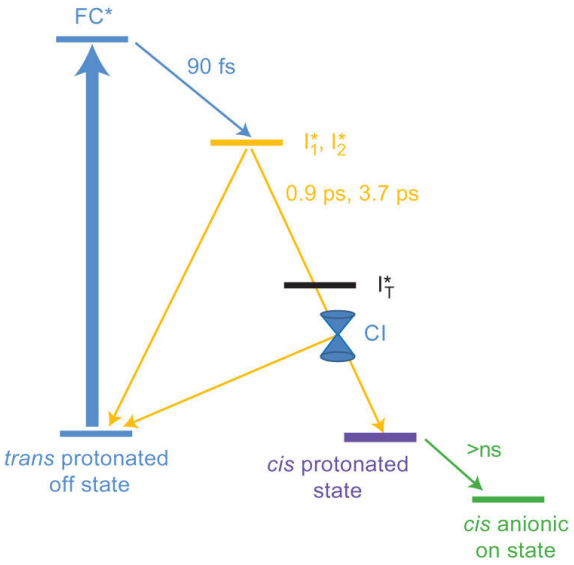


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Photo-dynamics of photo-switchable fluorescent proteins

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Reversibly photo-switchable fluorescent proteins find growing applications in cell biology, especially in super-resolution fluorescence microscopy [1]. However mechanistic details, in particular on the ultra-fast photochemical time scale, remain still unclear and hinder the development of optimized photo-switchable protein for super-resolution bio-imaging. We choose to study rsEGFP2 (Fig. 1) which is the most common protein used in RESOLFT super-resolution microscopy [2]. We employed time-resolved pump-probe absorption spectroscopy (TA) in solution to study photo-switching from the non-fluorescent (off) to the fluorescent (on) state. As reported for other photo-switchable fluorescent proteins evidence is also provided here for the existence of several intermediate states on the pico- and microsecond time scales that are attributed to chromophore isomerization and proton transfer, respectively. The structure of these crucial intermediate states were solved using an X-ray free-electron laser and serial femtosecond time-resolved crystallography (SFX). Our results provide insight into the mechanism of photoswitchable fluorescent proteins and suggest a strategy based on excited-state structures to rationally tailor their photophysical characteristics [3]. We will discuss here how TA and SFX are complementary techniques to solve the photodynamics of photo-switchable proteins.

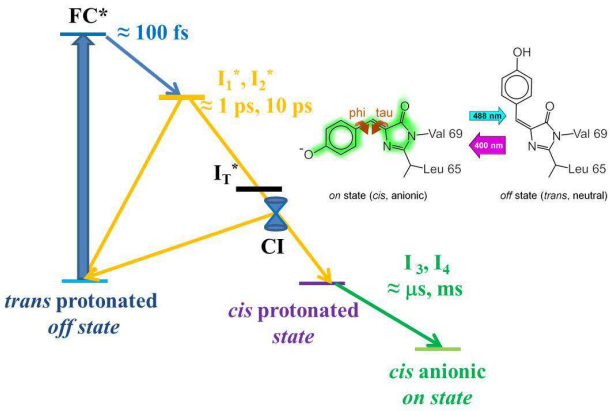

Fig.1 Photo-Dynamics of rsEGFP2

This research is carried out in collaboration with the Institut de Biologie Structurale in Gre-noble (Adam, Bourgeois, Byrdin, Colletier, Coquelle, Feliks, Field, Fieschi, Guillon, Schirò, Thepaut, Weik, Woodhouse), Max-Planck-Institut für medizinische Forschung in Heidelberg (Barends, Doak, Foucar, Hilpert, Kovacsova, Nass, Roome, Schlichting, Shoeman), Departe-ment of Physics in Rennes (Cammarata), and the SLAC National Accelerator Laboratory in Menlo Park (Aquila, Boutet, Hunter, Koglin, Liang, Robinson).

References

[1] 2014 Nobel Prize in Chemistry, W.E Moerner, S. Hell, E. Betzig for the development of super-resolved fluorescence microscopy, https://www.nobelprize.org/nobel_prizes/chemistry/laureates/2014/

[2] T. Grotjohann, I. Testa, M. Reuss, T. Brakemann, C. Eggeling, S. W. Hell, S. Jakobs, *eLife* 1 (**2012**), e00248.

[3] N. Coquelle, M. Sliwa, J. Woodhouse, G. Schirò, V. Adam, A. Aquila, T. R. M. Barends, S. Boutet, M. Byrdin, S. Carbajo, E. De la Mora, R. B. Doak, M. Feliks, F. Fieschi, L. Foucar, V. Guillon, M. Hilpert, M. Hunter, S. Jakobs, J. E. Koglin, G. Kovacsova, T. J. Lane, B. Lévy, M. Liang, K. Nass, J. Ridard, J. S. Robinson, Christopher M. Roome, Cyril Ruckebusch, Matthew Seaberg, Michel Thepaut, M. Cammarata, I. Demachy, M. Field, R. L. Shoeman, D. Bourgeois, J-P. Colletier, I. Schlichting, M. Weik, Nature Chemistry, DOI: 10.1038/NCHEM.2853 (2017).