Photoswitchable stimulated Raman scattering spectroscopy and microscopy

東大院工[1] ○寿 景文[1], 小関 泰之[1]

Univ. of Tokyo[1] ○Jingwen Shou[1], Yasuyuki Ozeki[1]

E-mail: shoujingwen@g.ecc.u-tokyo.ac.jp

Photoswitchable fluorescence is a powerful technique to realize super-resolution imaging, highlighting, and optical storage [1], while its multiplexing capability is limited [2]. Raman scattering is attracting attention because it generates narrowband vibrational signatures, which are potentially useful for highly multiplexed detection of different constituents [3,4]. Here, we demonstrate photoswitchable stimulated Raman scattering (SRS) spectroscopy and microscopy [5] assisted by photochromic molecules cis-1,2-Dicyano-1,2-bis(2,4,5-trimethyl-3-thienyl)ethene (CMTE). The narrowband Raman signatures can be switched with full reversibility by applying the irradiation of UV or visible light. The switching speed is evaluated as fast enough for RESOLFT-like application. The demonstration of live-cell imaging suggests the good compatibility to living systems and satisfying sensitivity of this method. We anticipate that photoswitchable SRS imaging will be a powerful foundation for super-multiplex super-resolution imaging.

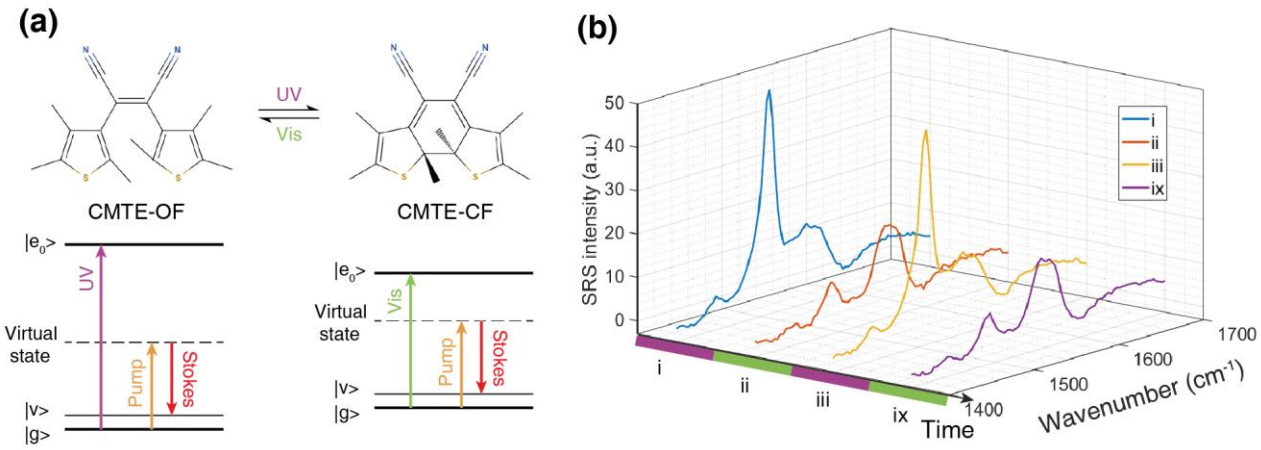

FIG. 1. (a) Molecular structures and simplified energy diagrams of opened form (OF) and closed form (CF) of CMTE. (b) Photoswitchable SRS spectra of 5-mM CMTE solution.

Reference

[1] Y. Yan, M. Marriott, C. Petchprayoon and G. Marriott, *Biochem. J.* **433**, 411 (2011).

[2] J. Lakowicz, *Principles of Fluorescence Spectroscopy*, 3rd edn. (Springer, 2006).

[3] L. Wei, Z. Chen, L. Shi, R. Long, A. Anzalone, L. Zhang, F. Hu, R. Yuste, V. Cornish and W. Min, *Nature* **544**, 465 (2017).

[4] F. Hu, C. Zeng, R. Long, Y. Miao, L. Wei, Q. Xu and W. Min, *Nat. Methods* **15**, 194 (2018).

[5] J. Shou and Y. Ozeki, *Opt. Lett.* **46**, 2176 (2021).