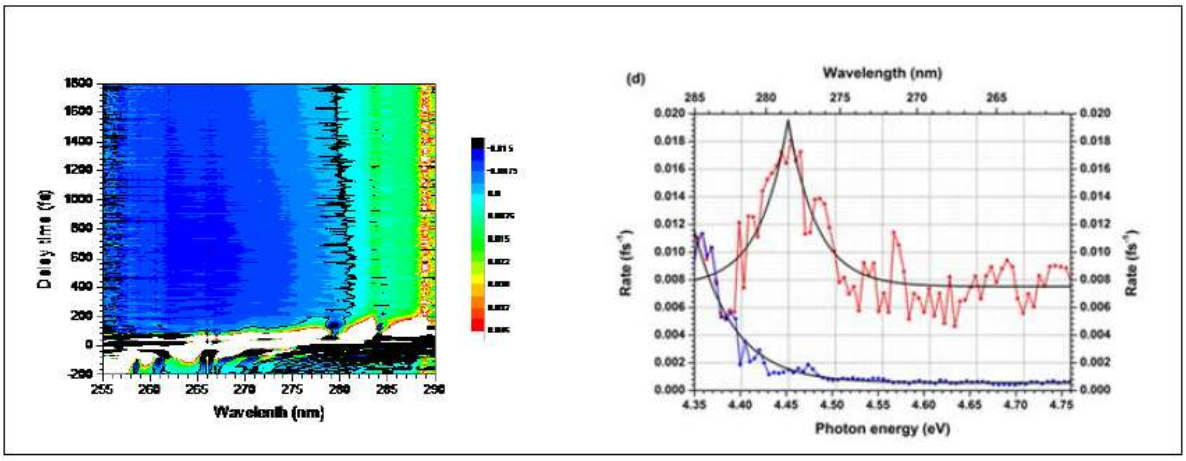
Ultrafast dynamics of uracil, thymine, and cytosine studied with a sub-10-fs deep ultraviolet laser

T. Kobayashi*

Ultrafast laser Research Center, Univ. of Electro-Communications, Chofu, Tokyo,Japan

Ultrafast spectroscopy of three DNA bases, uracil, thymine, and cytosine was studied using 9.6-fs deep ultraviolet (255 -290 nm) pulses generated by a chirped-pulse four-wave mixing [1] for both pump and probe. Sub-10-fs resolution difference absorption was studied in full probe spectral range using 128-channel lock-in amplifier. Ultrafast decay dynamics through the conical intersection are assigned from the first excited ππ* to the final ground state involving the nπ* states. Fig. 1 is the two-dimensional time-resolved (2DTR) difference absorption spectra of uracil in aqueous solutions in the time range of -200 -1800 fs. Fig. 2 shows the probe photon energy dependent fast and slow rates in thymine.



Figs.1(a) and (b): 2DTR difference absorption spectra of uracil and probe photon energy dependent fast and slow rates in thymine

The probe photon energy (*E*)dependences of both fast and slow rates are given by[2]

$$k(E) = k(_{E=E_0})e^{-\left|\frac{E-E_0}{\Delta E}\right|} \equiv k_0 e^{-\left|\frac{E-E_0}{\Delta E}\right|}$$

Here, E_0 and ΔE are the position and width of the conical intersection, respectively. The detailed discussion is to be made on the results of thymine, uracil, and cytosine.

References:

1. T. Kobayashi, Y. Kida, *Phys. Chem. Chem. Phys.,* 2012, **14**, 6200-6210

2. B. Xue, A. Yabushita, T. Kobayashi, *Phys. Chem. Chem. Phys.,* 2016, **18**, 17044-17053