

## Alkene-alkene photo-cross-linking reaction on the flipping-out field in duplex DNA

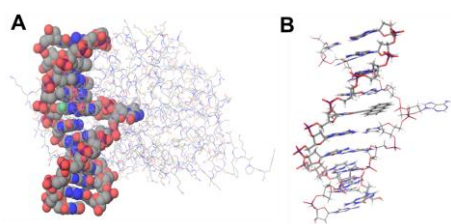
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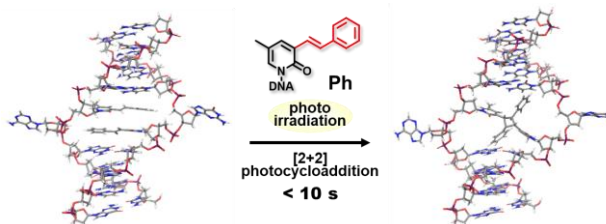
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Many enzymes acting on a nucleobase enable a specific chemical reaction by flipping the target base out of the helix and taking the base into an active site (Fig. 1A). For example, DNA methyltransferases catalyze the methylation at the 5-position of a cytosine. Similarly, artificial nucleic acids to induce the base flipping out are expected to create the specific field for chemical reactions, leading to a basis for the new functions (Fig. 1B).<sup>1</sup>

In previous study, we reported a novel type of base flip-inducing oligodeoxynucleotide (ODN) and alkyne-alkyne photo-crosslinking reaction using two 3-arylethynyl-5-methyl-2-pyridone nucleotides. In this study, we developed the base flip-inducing ODNs with alkene-type phenyl (Ph) or anthracenyl (An) base, which are 5-methylpyridone derivatives linked to aromatic compound (Ph or An) with an alkene linker at a C3 position. Both Ph and An bases flipped the complementary base on DNA and RNA and stabilized the flipped-out structure by the stacking interaction. In addition, a rapid photo-crosslinking was realized by taking advantage of the formed specific reaction field. The Ph-Ph combination provided a cross-linked product in a high yield by only a 10-sec photoirradiation (Fig. 2). Our alkene-alkene photo-cross-linking is prospective to be a new candidate to form crosslinked DNAs in addition to our previous alkyne-alkyne photo-cross-linking. All these results will elaborate in this presentation.



**Fig. 1.** (A) Base flipping by DNA methyltransferase (*M.HhaI*). (B) Base flipping by chemically-modified ODN.



**Fig. 2.** Alkene-alkene photo-cross-linking reaction.

1) K. Onizuka, K. Ishida, E. Mano, F. Nagatsugi, *Org. Lett.* **2019**, *21*, 2833-2837.