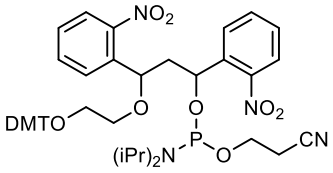
Caged Strand-Breaker II CEP

Product No. BA 0420

Product Information



$C_{47}H_{53}N_4O_{10}P$
Mol. Wt.: 864.93

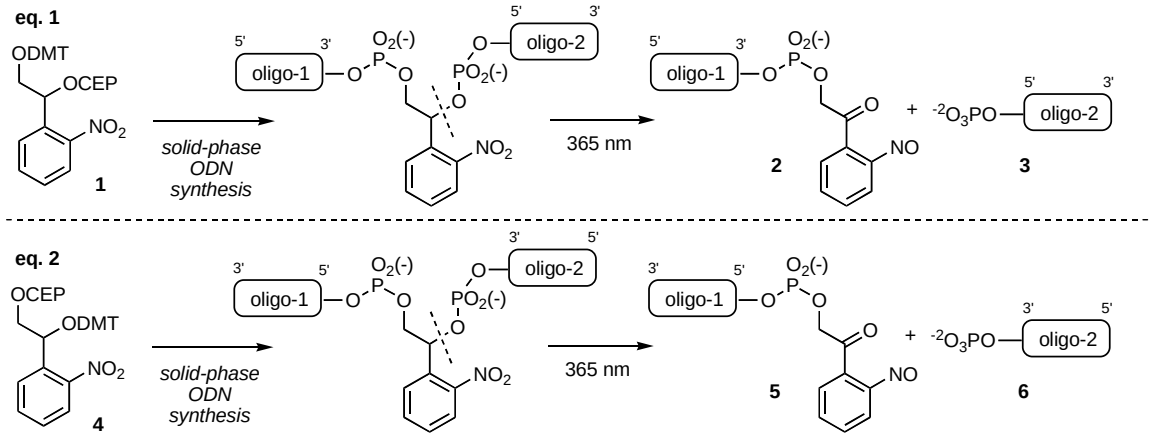
Once installed into an oligonucleotide, irradiation at 365 nm causes strand cleavage, leaving a phosphate group on the 5'-terminus and a hydroxyl residue on the 3'-terminus.

Introduction. Placing a photochemically labile group on or within a molecule of interest opens many possibilities for altering its properties by simple illumination.[1] For example, one popular strategy is to install a photolabile protecting group that interferes with an important property, rendering the molecule inactive, or "caged". Illumination of the sample removes the protecting group, uncaging the molecule and turning on its biological function. An example in the oligonucleotide field is the management of gene expression by blocking hydrogen bonding with photolabile protecting groups.

A very different process that is aided by photochemistry is the introduction of nicks in DNA using photolabile nucleotides or nucleotide surrogates.[1a] These so-called *"caged strand-breaks"* can be affected through the use of the Caged Strand-Breaker II CEP (BA 0420).

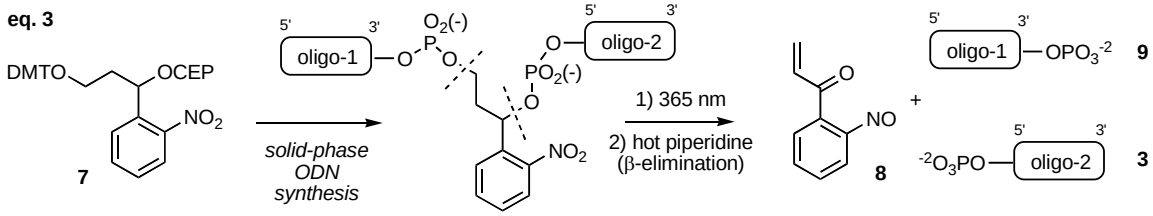
Overview of known non-nucleosidic caged strand-breaking monomers. Several monomers have been developed that can produce caged strand-breaks. Only those that are non-nucleosidic are considered here. Nucleosidic caged strand-breaking monomers are also known from the groups of Giese, Marx, Sheppard, Kotera, and Pirrung; see the review by Mayer and Heckel.[1a]

Urdea and Horn (US 5,258,506, 1993)[2] reported the non-nucleosidic monomers **1** and **4** (equations 1 and 2 below), which produce oligonucleotides that can be cleaved with UV light to give a single daughter strand bearing either a 5'-phosphate (**3** in eq. 1) or a 3'-phosphate (**6** in eq. 2), respectively. The other strands remain attached to the protecting group by-product (see **2** and **5**).

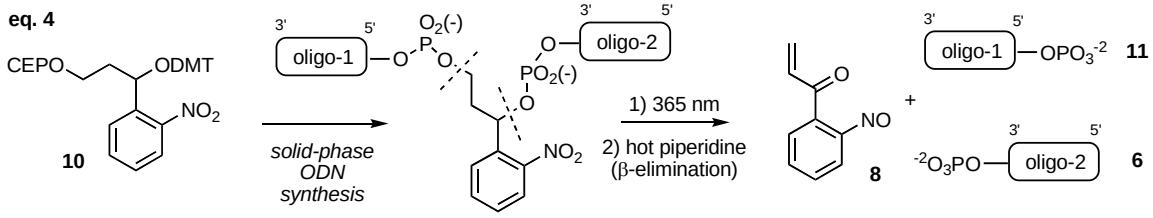


Taylor, *et al*.[3-6] and Raynor, *et al*.[7] have reported several non-nucleosidic monomers that cleave to liberate *both* daughter strands (eq. 3-6).

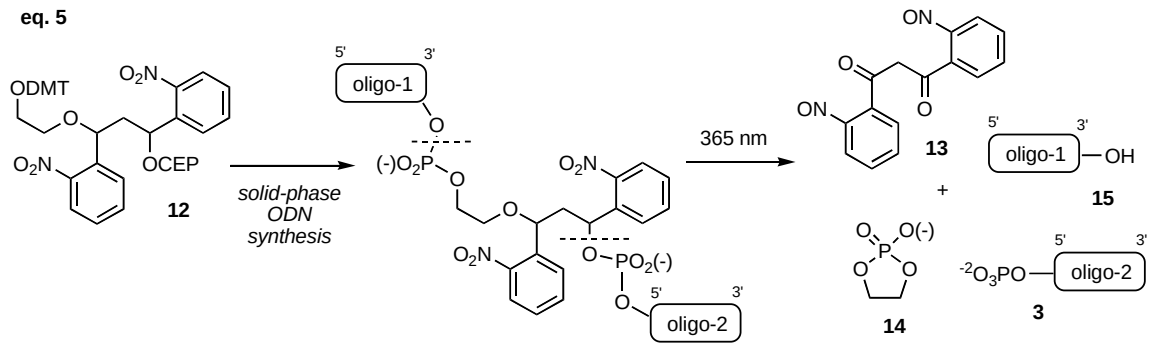
Monomer **7** produces an oligonucleotide that may be subjected to illumination, producing the phosphorylated daughter strands **3** and **9** plus the by-product **8** (eq. 3).[3,5] Unfortunately, only the 5'-phosphorylated daughter strand was produced at neutral pH; production of the 3'-phosphorylated strand required hot piperidine treatment to go to completion via a β-elimination reaction.[3]



The complementary monomer **10** produces the phosphorylated daughter strands **6** and **11** with the phosphate ends switched, again requiring a separate β-elimination step (eq. 4).[5,7] Monomers **7** and **10** could be used in tandem to solve the β-elimination problem,[5] but the requirement for two specialty monomers decreases the attractiveness of this approach.



Zhang and Taylor have developed a complementary monomer that leaves one of the daughter strands with a 3'-OH group (eq. 5).[4] Thus, the monomer **12** ultimately leads to the daughter strands **3** and **15** and the by-products **13** and **14**. We now offer 12 as Caged Strand-Breaker II CEP (BA 0420).



If your research requires strand breaks that result in phosphate groups on both daughter strands, please see our Caged Strand-Breaker CEP (BA 0315).

Use: *Where possible, the phosphoramidite and the resultant oligonucleotides should be protected from light until strand cleavage is desired.*

Dissolve the phosphoramidite in acetonitrile at concentrations recommended by the synthesizer manufacturer. Coupling should be carried out using standard instrument protocols. Cleavage from the solid support can be carried out under standard conditions, and standard deprotection conditions may be employed.

Zhang and Taylor[6] reported that photochemical decaging and strand cleavage occurred quantitatively at pH 7.0 (20 mM Tris-HCl, 1.5 mL Eppendorf tube) in 32 min after subjecting the sample to 365 nm light from a hand-held UV lamp (Ultra-Violet Products, UVGL-25, 720 μW/cm^2) at a distance of 7.6 cm.

References:

1. Reviews: (a) Mayer, G.; Heckel, A. *Angew. Chem. Int. Ed*. **2006**, *45*, 4900-4921. (b) Young, D. D.; Deiters, A. *Org. Biomol. Chem*. **2007**, *5*, 999-1005. (c) Tang, X. Dmochowski, I. J. *Mol. BioSyst*. **2007**, *3*, 100-110.
2. Urdea, M. S.; Horn, T. US Patent 5,258,506, Nov. 2, 1993.
3. Ordoukhanian, P.; Taylor, J.-S. *J. Am. Chem. Soc*. **1995**, *117*, 9570-9571.
4. Zhang, K.; Taylor, J.-S. *J. Am. Chem. Soc*. **1999**, *121*, 11579-11580.
5. Ordoukhanian, P.; Taylor, J.-S. *Bioconj. Chem*. **2000**, *11*, 94-103.
6. Zhang, K.; Taylor, J.-S. *Biochemistry* **2001**, *40*, 153-159.
7. Dell'Aquila, C.; Imbach, J.-L.; Rayner, B. *Tetrahedron Lett*. **1997**, *38*, 5289-5292.