

Photo-control of G-quadruplexes folding and unfolding with azobenzene derivatives

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G-quadruplexes are DNA secondary structures formed by guanine-rich sequences, which self-assembles into stacks of guanine tetrads. These structures exhibit a large variety of topologies, the folding/unfolding of which has been proven to be involved in numerous key-biological processes, such as DNA transcription, replication or repair.¹ It has also been shown that these processes can be induced by the photoisomerization of cationic photoswitches interacting with DNA.^{2,3} In this context, we undertook a study of the folding dynamics of several G-quadruplex-forming sequences interacting with AZO, a cationic azobenzene derivative. I will present the characterization of different complexes formed by AZO and several short G-quadruplex sequences by various techniques, such as UV-visible absorption, circular dichroism, which is particularly adapted to the study of these biological structures, NMR and femtosecond transient absorption. We now plan to study their folding/unfolding dynamics by time-resolved circular dichroism spectroscopy over an extended time scale from a few picoseconds to a few seconds.⁴

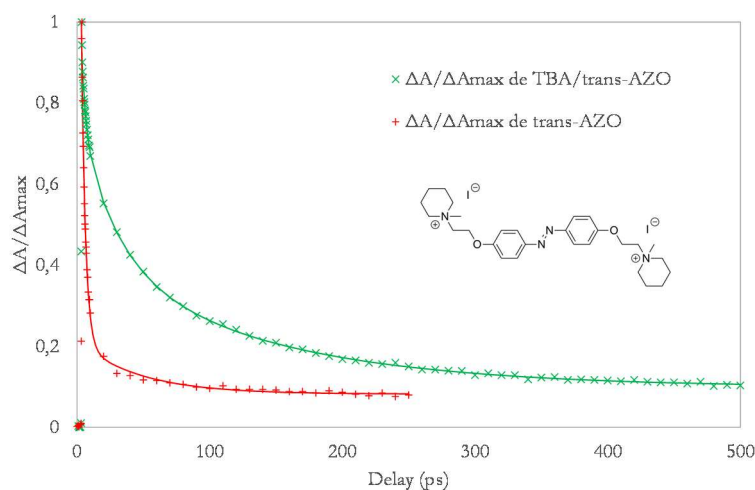


Figure 1. Transient absorption of AZO measured in aqueous solution (10mM Tris) at 520 nm after irradiation at 400 nm in presence or absence of the G-quadruplex sequence TBA (5'-(TGG TGG TGT GGT GGT)-3').

- [1] Varshney, D.; Spiegel, J.; Zyner, K.; Tannahill, D.; Balasubramanian, S. *Nature Reviews Molecular Cell Biology* **2020**, 21, 459-474.
- [2] Ogasawara, S.; Maeda, M. *Angew. Chem. Int. Ed.* **2009**, 48 (36), 6671-6674.
- [3] Wang, X.; Huang, J.; Zhou, Y.; Yan, S.; Weng, X.; Wu, X.; Deng, M.; Zhou, X. *Angew. Chem. Int. Ed.* **2010**, 49 (31), 5305-5309.
- [4] Hache, F.; Changenet, P. *Chirality* **2021**, 33 (11), 747-757.