FAST FOLDING DYNAMICS OF DNA G-QUADRUPLEX STUDIED WITH TIME-RESOLVED CIRCULAR DICHROISM

François HACHE, Pascale CHANGENET

Laboratoire d'Optique et Biosciences, Ecole polytechnique, 91128 Palaiseau, France
**francois.hachel@polytechnique.edu*

Keywords: time-resolved circular dichroism, DNA G-quadruplex

DNA G-quadruplexes (G4) are non-canonical nucleic structures whose physiological role is more and more documented [1,2]. G4 can exist under many different primary or secondary structures and are currently actively investigated. However, information on the fast dynamics of the folding/unfolding of G4s is still scarce. We have thus studied the fast dynamics of the conformation of simple G4 systems with a time-resolved circular dichroism technique. Two experimental configurations have been implemented. First, we have compared the behavior of four samples (Tel21, Tel22, TBA, 26CEB) after a millisecond temperature jump followed by a cooling down phase. Figure 1 depicts the raw results for Tel21, evidencing a rapid (between 10 and 300 ms depending on the starting temperature) unfolding of the sample and the subsequent refolding. This experiment yields relevant information on the kinetics and the thermodynamics of the folding process [3]

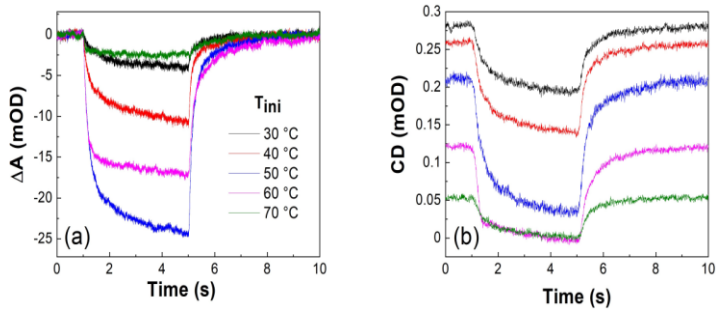

Figure 1: (a) ΔA and (b) CD changes measured at 293 nm for Tel21 with 80 mM Na^+, following a T-jump of 20°C after 1 s and a subsequent cooling down to the initial temperature after 5 s, for various T_{ini} indicated in panel (a).

In a second set of experiments, we used an azobenzene derivative to phototrigger the unfolding/folding of a TBA sample. Thanks to this technique, we can access the various steps of the unfolding and folding processes independently.
These two sets of experiments are complementary since the former gives information on the dynamical processes around the thermodynamic equilibrium whereas the latter investigates a full folding/unfolding process.

[1] R. Hänsel-Hertsch, M. Di Antonio, S. Balasubramanian, *Nat. Rev.* . **18**, 279 (2017).
[2] J. Spiegel, S. Adhikari, S. Balasubramanian, *Trends in Chemistry*. **2**, 123 (2020).
[3] K. Laouer, M. Schmid, F. Wien, P. Changenet, F. Hache, *J. Phys. Chem. B* **125**, 8088 (2021).