

Synthesis and Photochemical Characterization of Azobenzene-Functionalized Peptoids for the Chemical Storage of Solar Energy

^{1,2}Benjamin Tassignon, ¹Gwendal Henrard, ¹Julien De Winter, ²Jérôme Cornil, ¹Pascal Gerbaux

¹*Organic Synthesis and Mass Spectrometry Laboratory, Interdisciplinary Center for Mass Spectrometry, University of Mons – UMONS, 23 Place du Parc, B-7000 Mons, Belgium*

²*Laboratory for Chemistry of Novel Materials, Center of Innovation and Research in Materials and Polymers, University of Mons – UMONS, 23 Place du Parc, B-7000 Mons, Belgium*

Storing renewable energies represents a major challenge in modern science. The most abundant energy source is undoubtedly the Sun. Several storage concepts have already been studied and among them, chemical storage with **MO**lecular **Solar Thermal** systems (**MOST**) appears promising though challenging [1]. The working principle of those systems is based on iterative closed cycles of photoisomerization and back-isomerization between a parent compound and its metastable isomer. Energy is stored within the metastable isomer which possesses a certain half-life time and thermal energy is released during the thermal back-isomerization process [1,2]. Among the MOST systems, the azobenzene chromophore with its E → Z photoisomerization has been largely explored. However, the properties of the azobenzene compounds must be improved for MOST applications, especially due to the low storage enthalpy encountered to date for these molecules [2,3]. To do so, several strategies have been considered. In particular, anchoring chromophores on a macromolecular backbone appears to be an elegant strategy since cooperative effects between chromophores may help augmenting the stored energy as well as the half-life time [4].

We are nowadays exploring the possibility of preparing MOST systems based on a peptoid-type backbone supporting different azobenzene chromophores incorporated at key positions. We will take benefit of this poster communication to present some of our results related to the design of efficient azobenzene-containing peptoids for MOST applications. We will first describe the spectroscopic properties such as maximum absorption and molar absorptivities of peptoids bearing azobenzene side chains. We will further present the LC-MS methodology developed for measuring several crucial MOST properties including the thermodynamics and kinetics parameters of the photoisomerization processes.

References

[1] T.J. Kucharski, Y. Tian, S. Akbulatov, R. Boulatov, *Energy Environ. Sci.* **2011**, *4*, 4449–4472. ; [2] A. Lennartson, A. Roffey, K. Moth-Poulsen, *Tetrahedron Lett.* **2015**, *56*, 1457–1465. ; [3] L. Dong, Y. Feng, L. Wang, W. Feng, *Chem. Soc. Rev.* **2018**, *47*, 7339–7368. ; [4] D. Zhitomirsky, E. Cho, J.C. Grossman, *Adv. Energy Mater.* **2016**, *6*, 1–8.