FULLY PHOTODEGRADABLE BLOCK COPOLYMER NANOPARTICLES FOR DUAL RELEASE OF CARGO AND RADICALS

Emna Chaabouni[a, b], Vitalii Tkachenko[a], Loic Vidal[a], Noureddine Allouche[b,*], Abraham Chemtob[a,*]

[a] Département de chimie Institut de Science des Matériaux de Mulhouse Université de Haute-Alsace, Mulhouse, France
[b] Département de chimie organique Université de Sfax, Tunisie

This work is devoted to the synthesis, characterization and application of photodegradable amphiphilic block copolymer nanoparticles containing a photosensitive *o*-nitrobenzyl ester pendant group. Three copolymers based on poly(hydroxyethyl acrylate)-*b*-poly(*o*-nitrobenzyl acrylate) were synthesized by polymerization-induced self-assembly process (PISA) [1,2] using a reversible addition-fragmentation chain transfer (RAFT) mechanism [3]. Under UV irradiation (365 or 385 nm), the electronically excited nitrobenzyl group causes the cleavage of the pendant group and H abstraction on polyacrylate backbone leading to a gradual chain degradation and a disassembly of the polymer nanoparticles. This approach differs from those based on light-changeable hydrophilic hydrophobic balance to create light-breakable micelles. We also show that this type of block copolymer nanoparticles undergoing fast photoinduced disintegration in a matter of minutes causes a generation of free radicals. This burst release of radical can be utilized to decompose specific molecules, such as methylene blue, in a similar manner as systems used for photodynamic therapy.

[1] Vitalii Tkachenko, Camélia Matei Ghimbeu, Cyril Vaulot, Loïc Vidal, Julien Poly and Abraham Chemtob, RAFT-photomediated PISA in dispersion: mechanism, optical properties and application in templated synthesis. Polym. Chem., **2019**, 10, 2316–2326.

[2] D'Agosto, F.; Rieger, J.; Lansalot, M. RAFT-Mediated Polymerization-Induced Self-Assembly. *Angew. Chem. Int. Ed.* **2020**, *59* (22), 8368–8392.

[3] Chao Liu, Chun-Yan Hong, and Cai-Yuan Pan, Polymerization Techniques in Polymerization-Induced Self-Assembly (PISA), The Royal Society of Chemistry. Polym. Chem. **2020**, 11, 3673-3689